CITY SERVICES COMMITTEE

REPORT No. 7

1
ENVIRONMENTAL ASSESSMENT STATEMENT - NEW REFUSE FIRED STEAM PLANT

The Committee resubmits Clause 29 of its Report 4:

The Committee submits the report (December 1982) from the Commissioner of Public Works:

City of Toronto Department of Public Works

Environmental Assessment New Refuse Fired Steam Plant

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(Letter of Transmittal, dated December 15, 1982, from the Commissioner of Public Works)

Subject: Environmental Assessment Statement for a new Refuse Fired Steam Plant - Gulf Oil Site.

Origin: Commissioner of Public Works (c39csc82631:33)

Comments: On June 16, 1982, your Committee approved my report on a Draft Digest of the Environmental Assessment Statement for the proposed new Refuse Fired Steam Plant. The recommendations in that report were as follows:

1. That your Committee approve of this Draft Digest of the Environmental Assessment Statement;

2. That your Committee now consider the time and place for the necessary public meetings and appropriate advertisements in the press;

3. That your Committee approve of Appendix G and that it receives wide distribution to all interested parties, community groups and residents' associations; and

4. That Appendix G of the Statement not be printed or distributed until such time as the City has been informed by Ontario Hydro and/or the Ministry of Energy as to their decision on the Hearn Plant.

On June 22, 1982, the Chairman of Ontario Hydro advised the City Clerk that the Board of Ontario Hydro did not wish to interfere or appear to compete with the City's proposal for a new refuse fired steam plant at Lake Shore Boulevard East and Cherry Street. Accordingly, and in line with recommendation 4. above, Appendix G of the Statement was distributed to a large number of interested parties (see Appendix H).

As a result of comments arising from the City Services Committee meetings, I have modified some wording in the Statement and have incorporated some prime questions and answers arising from the presentations on the proposal, as a result of the two widely advertised meetings which took place in September of 1982.

I now attach for your Committee's consideration and approval the Environmental Assessment Statement for the new Refuse Fired Steam Plant which, upon approval by Council, will be submitted to the Minister of the Environment for review and decision.

The Environmental Assessment Statement, when submitted to the Minister, will be accompanied by the following relevant documents:

A. List of Studies and Reports on Matters related to the Undertaking under the control of the City of Toronto

Item A District Heating Study, Summary and Policy Report, December, 1973

Item B District Heating Study, Volume 1, The Main Study, December, 1973

Item C District Heating Study, Volume 2, Support Studies, December, 1973

Item D District Heating Study, Volume 3, Appendices, December, 1973

Item E District Heating Study, Appendix 3B1, Selected Heat Demand and Cost Model Output, December, 1973

Item F District Heating Study, Appendix 3B2, Symaps Showing Predicted Air Quality, December, 1973

Item G Report of The Committee of Independent Consultants to the City of Toronto Committee on Public Works, dated May 5, 1975

Item H Report of The Committee of Independent Consultants on the Toronto District Heating Study Proposals from Private Enterprise and Submissions from Interested Parties, dated July 3, 1975

Item I Report of The Committee of Independent Consultants on Review of Current Technologies for a Refuse Fired Steam Plant, August 1979

Item J Report to Committee on Public Works re Independent Consultants Review of Current Technologies for R.F.S.P., dated December 3, 1979

Item K City of Toronto, Environmental and Economic Update for Refuse Fired Steam Plant, Summary of Technical Studies, February 1982 - MacLaren Engineers, Lavalin

Item L City of Toronto Environmental and Economic Update for Refuse Fired Steam Plant, Technical Discussion, February 1982 - MacLaren Engineers, Lavalin

Item M Report of Port Industrial Development Task Force - October 1980.

Item N Maps showing location of proposed R.F.S.P.

B. List of Studies and Reports on Matters related to the Undertaking not under the control of the City of Toronto

Item A1 A Waste Management Master Plan for Metropolitan Toronto, Currie Coopers & Lybrand Ltd & James F. MacLaren Ltd, August 1980

Item B1 Ontario Hydro - Refuse Burning Study (Phase II), Volume 1, Energy Studies and Development Department, Report No. 81023, January, 1981

Item C1 Ontario Hydro - Environmental Evaluation of Refuse Fuel Conversion of R.L. Hearn GS, Environmental Studies and Assessments Department, Report No. 80168, June 1981

Item D1 EPA - Environmental News - November 19, 1981 - Interim EPA Evaluation of Dioxin Hazard at Resource Recovery Facilities.

Item E1 Arthur D. Little, Inc.: Study on State-of-the-Art of Dioxin from Combustion Sources; issued by the American Society of Mechanical Engineers - 1981.

Item F1 Ontario Research Foundation 1977: Final Report on Polychlorinated Biphenyls Source Testing Survey for Environment Canada.

Recommendations:

1. That your Committee request City Council to approve of the form of the Environmental Assessment Statement - New Refuse Fired Steam Plant.

2. That your Committee request City Council to approve of the submission of the Statement and its related documents noted above, to the Minister of the Environment for the required review and decision.

3. That the appropriate City Officials be authorized to take whatever action is necessary to give effect to the foregoing.

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December 1982

Environmental Assessment New Refuse Fired Steam Plant

1.0 Purpose of the Undertaking

The proposed Refuse Fired Steam Plant will replace the existing Pearl Street Fossil Fuel Steam Plant which has been subject to restraining orders from the Provincial Ministry of the Environment since 1970.

The existing Pearl Street Plant which is owned by the Toronto Hydro-Electric System (THES) and which supplies steam to customers within the Toronto Downtown Planning District, does not comply with the standards set under the Air Pollution Control Act, 1967, due to its short stack and the impingement of exhausts therefrom on adjacent buildings. A very tall stack, more than 300 m in height and dominating the city skyline, would be required to overcome emission and impingement problems and the requirement for that installation was stated by Provincial Regulatory Authorities as early as 1968. The City Council would not accept the aesthetics of such a structure and refused to issue the necessary building permit for its construction. Consequently, it commissioned a study of the overall problem of downtown heating to seek other solutions.

This study, the Toronto District Heating Study (TDHS) of 1973 concluded that the replacement of the Pearl Street Plant by a *refuse* fired steam plant (RFSP), would provide the most advantageous and economic means of solving the downtown impingement problem when supplying steam to an *integrated* system. A large district heating system would provide a sufficient summer baseload steam demand to match the capacity of the refuse fired boilers of the proposed plant. The first step of the TDHS' recommendation - the integration of the four district heating systems, namely the Toronto Hydro-Electric System (THES), the University of Toronto (U of T), Toronto Hospitals Steam Corporation (THSC) and the Ministry of Government Services (MGS) - has been implemented. Completion of the integration contract is now scheduled for Spring 1983.

The construction of a refuse fired steam plant (RFSP) at a location adjacent to the downtown core now follows as a logical consequence. The location of the new plant would solve the impingement problems and the use of refuse as fuel for this new steam plant would offset the capital costs for the plant's construction by reducing the total fuel costs of the Toronto District Heating System.

2.0 Advantages and Disadvantages

2.1 Summary Description of the Undertaking

The proposed undertaking to be assessed is the generation of steam at a refuse fired steam plant (RFSP) at the former Gulf Oil site at Lake Shore Blvd East and Cherry Street, and the supply of the steam, so generated, to the Toronto District Heating System.

The proposed RFSP incorporates refuse fired heat recovery equipment of the "mass-burning" type, capable of burning "as-received" municipal refuse delivered by local collector trucks and transfer vehicles. Each of the two incinerator units has a rated capacity of 635 tonnes per day which corresponds to a total annual plant capacity of 350,000 tonnes. In addition, the plant includes two interruptible gas fired conventional steam generating units to supplement the steam output of the refuse fired units during peak demand periods and incinerator equipment downtime. Electrostatic precipitators and a stack of approximately 235 m above grade will ensure that air quality impacts comply with Ontario's standards.

Alternative methods of carrying out the undertaking, i.e. burning any type of fossil fuel in lieu of refuse, as well as alternatives to the undertaking were investigated. The latter included alternative sites, heating with electricity, the use of the R. L. Hearn G.S. and the continuation of the restricted use of the Pearl Street Plant. Advantages and disadvantages of these alternatives were compared with those of the undertaking.

2.2 Advantages and Disadvantages of the Undertaking

The proposed RFSP will replace the existing Pearl Street Fossil Fuel Steam Plant which has been subject to restraining orders from the Provincial Ministry of the Environment since 1970. This replacement and the consequent abandonment of the Pearl Street Plant will eliminate air quality problems due to impingement of emissions from its stack on high-rise buildings in downtown Toronto. Demolition of the Pearl Street stack, enabled by the abandonment, will improve the downtown skyline.

The use of the proposed RFSP will result in the conservation of non-renewable fuel resources, estimated at the equivalent of 456,000 barrels of oil annually, conservation of land use by reducing the need for landfill area and the recovery of resources from waste such as metals, glass and usable aggregate for road construction.

Soil and groundwater samples from the former Gulf Oil site showed high levels of phenols due to the former use of the site for oil storage facilities. The construction of the proposed RFSP and the associated site landscaping will result in substantial removal of such contaminated soil and a long-term benefit will be the improvement of ground water quality. Landscaping of the plant site will make a marked improvement in the site appearance compatible with the proposed Industrial Park at the Leslie Street spit.

The combination of a facility which serves as an efficient and reliable supplier of steam to the customers of the Toronto District Heating Corporation and at the same time affords the Metropolitan Toronto Corporation a convenient and reliable solid waste disposal alternative is a significant benefit.

The construction of the required stack (235 m) will have a visual impact upon the urban skyline. However, it would be comparable in height to existing stacks within the Port Industrial District, such as those of the R. L. Hearn Generating Station, Main Treatment Plant (Ashbridge's Bay) and the Commissioners Street Incinerator. Although under current conditions it is unlikely that HCl concentrations would ever exceed legislative requirements, it is probable that HCl scrubbing will be provided. This would substantially reduce the required stack to 100 m. In any case, sensitive design regarding the stack, its form, colour, and lighting can help to blend this feature into the skyline.

Refuse delivery will increase the traffic on the roads in the vicinity of the site. However, due to the large amount of traffic already existing and the even larger road capacity around the site, the additional truck volume will have a negligible effect on both traffic flow and noise level.

Recent surveys indicate that by substituting municipal refuse for fossil fuels as primary fuel at the new plant, the exhaust gases will contain a higher level of dioxins. However, the results of published investigations (7, 8) show that the current levels of the tetrachlorinated dioxin (TCDD)

discharged from municipal mass burning plants do not present a public health hazard to residents living in the vicinity of the plants. The continuing and successful operation of more than 200 similar plants across Europe give confidence to these investigations.

As stated in the report on Dioxin from Combustion Sources (8), these higher levels of dioxin have to be viewed in the general perspective of pollution associated with refuse disposal. Overall health risks from other methods of solid waste disposal, such as landfill, are probably at least as great as the risks from potential discharges of dioxins from combustion of solid waste.

2.3 Alternative Methods of Carrying out the Undertaking

Alternative methods of steam production would be by the burning of refuse or by the burning of a fossil fuel such as natural gas, oil or coal. While the merits of these fuels are discussed in more detail in the Technical Discussion (2), a short description of each follows:

(a) Natural Gas: Clean burning and does not require any pollution control devices. At the time of writing, natural gas is in relatively good supply; as a non-renewable resource, its use at the steam plant might be affected by future availability.

(b) Oil: Requires more pollution controls and a higher stack than an equivalent gas burning plant. Again, oil is a non-renewable resource and one that is also imported from unsecured or potentially unreliable sources. Both No. 6 residual fuel oil and No. 2 distillate oil are potential fuels. The latter features reduced emissions, but at higher cost.

(c) Coal: A non-renewable resource which requires high efficiency pollution control equipment and a higher stack than any of the alternative fossil fuels. Inherent problems associated with coal are: importation from the United States or costly transportation from within Canada, expensive storage in order to be environmentally satisfactory, expensive handling, high capital cost in comparison to other fossil fuels and a source of acid rain. The cost of coal, however, when compared with that of other fossil fuels is lower for equivalent heating value.

The use of any of these fuels involves lower capital construction costs than the preferred refuse burning scheme for equivalent steam capacity. However, none of them is conservation oriented and the fuel cost differentials adversely affect the overall operating costs of the plants.

A steam generating plant at the former Gulf Oil site burning a fossil fuel will have the same beneficial effects as described above for the RFSP but with the advantage of a substantially lower stack.

The combustion of fossil fuels would not present a problem as far as dioxin emissions are concerned, but fossil fuel options would increase the requirement for landfill sites with the problems associated with solid waste disposal by that method. Moreover, burning any of the three fossil fuels would not conserve non-renewable resources. The use of natural gas as fuel at the Gulf Oil site would not increase truck traffic. However, the use of fuel oil would generate additional traffic, as would the burning of coal. The latter having additional and major disadvantages in that stack emissions are a source of acid rain and coal storage creates dust problems.

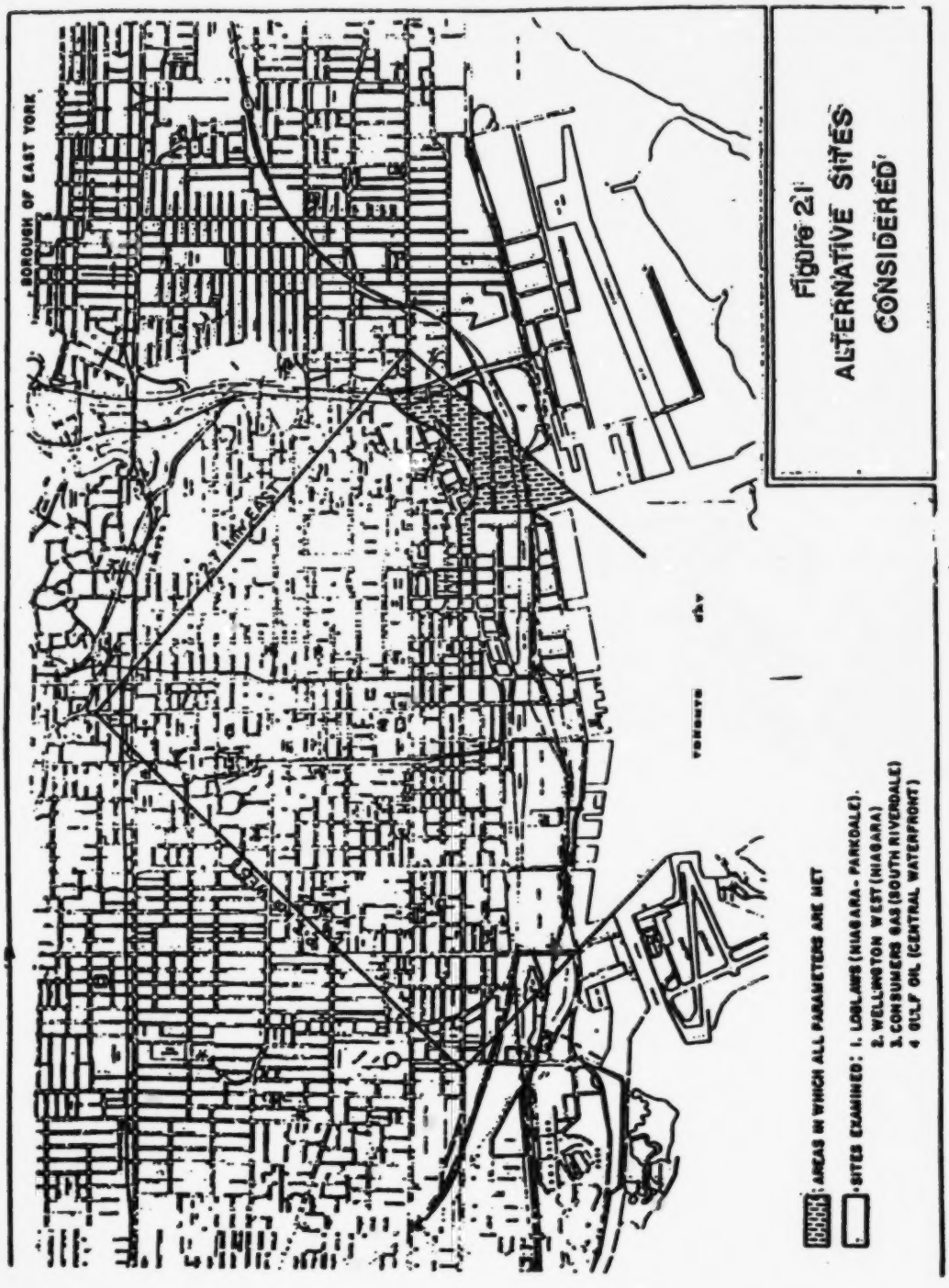

BOROUGH OF EAST YORK
TORONTO
AREAS IN WHICH ALL PARAMETERS ARE MET
SITES EXAMINED: 1. LOBLAWS (NIAGARA - PARKDALE).
2. WELLINGTON WEST (NIAGARA)
3. CONSUMERS GAS (SOUTH RIVERDALE)
4 GULF OIL (CENTRAL WATERFRONT)

Figure 21
ALTERNATIVE SITES
CONSIDERED

2.4 Alternatives to the Undertaking

A number of other sites and schemes have been proposed which would affect the plan to supply steam for the integrated district heating system from the RFSP and the plan for solid waste disposal in the Metro area. These are as follows:

(a) Alternative Sites

Following publication in 1974 of the Toronto District Heating Study (TDHS) (1), investigations into appropriate sites (Figure 2.1) for the recommended refuse fired steam plant were initiated by the City of Toronto Planning Board. In his report to the Committee on Public Works of April 23, 1974, the Commissioner of Planning outlined the parameters for site selection consideration regarding four potential sites and made the following recommendations as a result of his Board's investigations:

Site Location Parameters

i) the site of the proposed heating plant should not be more than 2.4 km from the intersection of King and Bay Streets;

ii) the site should be no closer than 1.6 km from the CN Tower;

iii) the site should not be located within the Downtown Planning District;

iv) the site should be located with direct access to a major arterial road;

v) the site should be at least 2.8 ha in size;

vi) the site should be located no closer than 150 m from an existing or proposed residential neighbourhood;

vii) the site should be located so that trucks serving the plant do not use an arterial which travels through or beside an existing or proposed residential area;

viii) the site should be located so as to enable direct steam servicing to major projects en route between the plant and the Downtown;

ix) the site should be located so as to enable provision of steam to Port Area Industries;

x) where possible, uses now occupying the site that are still required in the area should be either incorporated in the project or relocated in the vicinity.

Sites Considered

When locational parameters designed to protect residential areas are added to those proposed by the TDHS, it appears that there is only one area of the City that meets all parameters. This area is generally located to the east of Parliament Street south of King Street. Unfortunately there is no suitable available site in this area. Most sites north of Queen Street will be too small or too close to residential areas. Potential sites on the west of the Downtown are either too far from the steam load-centre at King and Bay Streets or too close to the CN Tower.

Four sites are examined below, each meeting some of the parameters. Of these, the one which most nearly satisfied all the guidelines is the former Gulf Oil site at Cherry Street and Lake Shore Boulevard.

The Loblaws Site (Niagara-Parkdale)

This site is located at the corner of Hanna and Liberty Streets, in the area known as 'Niagara-Parkdale'. It is owned by Loblaws and now contains a warehouse not in full use. Its advantages are its size, its remoteness from any residential area, and its proximity to a large complex of industries that might use steam heat.

The disadvantages of the site are its distance of 3.2 km from King and Bay Street, and its lack of access to the site from an arterial road.

The Wellington West Site (Niagara)

This site is located on Wellington Street west of Bathurst Street, across the road from Stanley Park. This site has several advantages, in relation to the criteria outlined above. It is some 3.2 ha in size, within 2.7 km of King and Bay Street, more than 1.6 km from the CN Tower, and has access via Wellington to Bathurst Street and Strachan Avenue, which provide direct links to Lake Shore Boulevard. An additional advantage is that the site is already publicly owned, part by the City of Toronto and part by Metro Toronto.

However, the Wellington site has three major disadvantages. Firstly, it is located within 150 m of residences in the Niagara Neighbourhood, where considerable effort has already been made by the City and the local residents to reduce disruptions from non-residential uses. The removal of the South Stanley Park Soccer Stadium and pollution abatement procedures against Toronto Refiners and Smelters are two examples. Introducing a new and potentially obtrusive non-residential use is inconsistent with these other actions.

Secondly, most of the trucks serving the plant would approach along Wellington from Bathurst Street. This route passes by existing housing and the sites of two proposed housing projects. Although this problem would not occur if trucks were routed west to Strachan Avenue, the presence of a major grade level crossing on Strachan just south of Wellington Street precludes this as the major approach to the plant.

Thirdly, the western part of the site now provides parking for approximately 300 cars and trucks for local industries, including Massey Ferguson, John Inglis and Toronto Abattoirs. This parking can not be easly accommodated elsewhere in the vicinity and should preferably be incorporated in any future redevelopment of the Wellington West site.

The Consumers' Gas Site (South Riverdale)

This site is located east of the Don River south of Eastern Avenue. Its major advantages are its size, and its proximity to Port Area Industries. The site has numerous disadvantages, including its distance of 3.2 km from King and Bay Streets, the necessity of piping the steam across the Don River, and its proximity to residential areas in South Riverdale.

The Former Gulf Oil Site (Central Waterfront)

The site is located at the northeast corner of Cherry Street and Lake Shore Boulevard East, at the intersection of the Gardiner and Don Valley Expressways. This site has numerous advantages: its 9.64 ha size, its 400 m distance from residential areas, its direct access to Lake Shore Boulevard and its present C.4 V.2 - Heavy Industrial Zoning. It is well over 1.6 km from the CN Tower, and is only slightly farther (2.9 km) from King and Bay Streets than suggested in the parameters. It is close to Port Industries and to the St. Lawrence Neighbourhood, thereby allowing for direct supply of steam to these facilities when the opportunity arises.

Site Selection

Based on his Board's investigations, the Commissioner of Planning recommended that the (former) Gulf Oil site be given serious consideration as a potential site.

In its 1975 report to Council, the Committee of Independent Consultants stated that it had reviewed the Planning Board conclusions and was in concurrence with the Commissioner that the Gulf Oil site appeared to meet most of the criteria laid down for the site of a remote steam plant and accordingly, that this property should therefore be given serious consideration.

Not only is the site immediately available for the location of the proposed plant, but it also meets the requirements of the Planning Board and has the least impact on surrounding neighbourhoods of any of the sites considered. Municipal services, including sewer, water and gas mains, are adjacent to the site, thereby minimizing servicing costs.

Accordingly, the environmental impacts of the proposed facility and the ameliorating measures necessary to minimize them were considered for this, the preferred site, as were the effects of the steam transfer main to the downtown load-centre at King and Bay Streets.

(b) Heating with Electricity

This option was investigated in detail in the Toronto District Heating Study (1) of 1973 and it was concluded that a maximum long-term benefit would be realized by moving toward the objective of an electrically heated downtown core. Suggestions were made that electric heating be made mandatory for all new buildings or additions to existing buildings exceeding 4600 m2 of gross floor area and that conversion of existing systems to electric heating be encouraged provided that the building heat conservation standards were made equal to those stipulated for new buildings.

At the same time, it was suggested that district heating could prove an alternative to electric heat, where the district heating system had the capacity to serve new customers and where there were sound reasons for so doing. It was recognized that once built with a steam, hot water or warm air heating system, an older building cannot be easily or economically converted to electric heating unless done in conjunction with a major renovation to bring it up to contemporary standards.

(c) The Use of the Commissioners Street Incinerator

The possibility of surplus heat as steam being available to the integrated system from this Metro-owned and operated refuse incinerator had been considered. However, a more recent proposal (4) has been made to convert this plant into a heat recovery facility to provide the adjacent Continental Can Company with steam. The proposed conversion would have a pay-back on investment period of some five years. Were such a conversion to be made, no surplus steam would be available to the TDHC, and this alternative was therefore dropped from further consideration.

(d) The Use of the R. L. Hearn Generating Station

Originally Ontario Hydro was investigating the viability of using either RDF or mass-burning refuse incinerators at the converted Hearn plant to supplement its coal/natural gas facilities in producing electricity. The possibility of concentrating on steam production for the integrated district heating system was introduced by the Ministry of Energy and Ontario Hydro's draft report for the appropriate conversion of the Hearn Generating Station was completed in 1980 (5). The conversion of the R. L. Hearn Plant for the production of steam and electricity from refuse is a practical alternative. However, the Chairman of Ontario Hydro's Board of Directors has now confirmed that Ontario Hydro would be prepared to offer a limited involvement in a refuse-fired steam plant located on the Hearn site only if the Toronto proposal does not proceed.

(e) Continuation of the Use of the Pearl Street Plant

In the case of "no action whatsoever", the Pearl Street Plant would operate as a peakload plant in the integrated district steam system. When in service, the plant would continue to contravene the standards set by the Air Pollution Act, 1967, although actual air quality impact would be less with the integrated system than in the past.

The demand for steam from the downtown customers has not increased in accordance with original projections made by the Toronto District Heating Study (1) in 1973. Existing demand could be met by the integrated system's steam plants, although system expansion would have to be limited. An analysis of the 1981 steam costs for this case shows that they would compare favourably with those from the proposed refuse fired plant. However, as described in Section 4.3 of the Technical Discussion (2) a comparison of costs for the "as is" integrated system and a system incorporating the proposed refuse fired plant shows that the refuse fired plant would prove superior after a few years of operation; this is due primarily to rapidly escalating costs of fossil fuel.

2.5 Other Considerations Affecting the Undertaking

(a) Watts from Waste

This scheme (6), with participation by the Metropolitan Corporation, Ontario Hydro and the Ministry of the Environment, would have involved the construction of a refuse processing facility at Disco Road. The resulting product, refuse derived fuel (RDF), would be burnt at the Lakeview Generating Station, thereby powering steam turbines to generate electricity.

The Watts from Waste proposal, while previously of interest to Metro in its solid waste management programme, does not answer the need for steam supply to the integrated TDHC. In any event, on May 28, 1982 the Council of the Corporation of Metropolitan Toronto adopted a report from their Commissioner of Works recommending that the project be terminated for the reason that:

"(a) the findings, arising from studies of the R.L. Hearn Plant conversion versus an independent City-erected refuse-fired steam plant, that mass burning technology is much more reliable than preliminary processing such as proposed for Watts from Waste;

(b) the failures and shutting-down of similar processing plants in Chicago and Milwaukee, which had been considered models of the type of approach being followed by Watts from Waste;

(c) negative comments about this type of processing for refuse-derived fuel in the Waste Management Master Plan for Metropolitan Toronto, adopted in principle by Metropolitan Council."

(b) Maple Landfill

In 1979 the firm of Waste Management Inc. made a proposal for the development of a large privately-owned and operated refuse disposal site north of Metropolitan Toronto, in Maple. Environmental Hearings and Site Approval formalities took place in 1980. Since the availability of the Maple Landfill site would significantly relieve the Corporation of Metropolitan Toronto of its need to find new landfill capacity, the Corporation entertained a proposal from Waste Management Inc. for the purchase of the site. However, there are a number of conditions which still remain to be satisfied before this matter can be resolved.

Although any use of the Maple Landfill site for disposal of refuse generated in Metro does not alleviate the need for a new steam plant, this proposition could have an impact on the supply of solid waste to the proposed refuse fired steam plant. Therefore, in the analysis of disposal alternatives available to Metro it had been considered that the Maple site would receive significant quantities of "private" or non-municipally collected wastes, as well as approximately 500,000 tonnes per year of Metro's refuse. However, even under these assumptions, an adequate supply of refuse for the proposed plant would still be available (see Chapter 3 of the Technical Discussion (2) for a description of the pertinent solid waste management case study).

(c) Kipling/Horner Incinerator

Incineration at this location may be desirable to provide additional flexibility for Metro's Waste Disposal Programme but there is not sufficient local demand to justify a steam generating plant.

(d) Inco (Sudbury)

Mention has been made of a proposal to send Metro refuse by rail to the Inco plant in Sudbury. Although details are extremely vague, this plan might be of interest to Metro in their long-term planning but it is not expected to influence consideration of the refuse fired steam plant proposal.

(e) Reduction of Waste - Separation at the Source

Important factors in successful solid waste management are reduction of waste at source and economic recovery of used materials. However, it must be recognized that achievement of the former factor depends on a protracted period of public education in a society noted for conspicuous consumption and, inevitably, economic recovery of used materials such as glass, tin cans and paper depends on the availability of markets for these categories of waste.

It is to be hoped that a sustained programme to make the public aware of the benefits of resource conservation and the introduction of economic incentives which would encourage the development of markets for salvaged material can be integrated with a comprehensive solid waste management programme for Toronto.

In the meantime, the proposed plant will at least enable the recovery of metals from refuse and conserve valuable land space by reducing volume to be disposed of at landfill sites.

3.0 Description and Statement of Rationale

3.1 The Undertaking

The undertaking to be assessed is the generation of steam by burning residential and commercial refuse at the former Gulf Oil Site at Lake Shore Blvd East and Cherry Street and the supply of the steam, so generated, to the Toronto District Heating System.

3.2 Technology and Design Considerations

A functional design for a RFSP of 1270 t/d capacity with two incinerator units was undertaken in order to develop the estimates of capital cost for an environmentally acceptable plant satisfying the requirements of both the existing Metro solid waste management system and the Toronto District Heating System.

The steam plant proposed and described in the Technical Discussion (2) incorporates refuse fired heat recovery equipment of the "mass-burning" type, capable of burning "as-received" municipal refuse delivered by local collector trucks and transfer trailer vehicles. In addition, the plant includes two interruptible gas fired conventional steam generating units to supplement the steam output of the refuse fired units during peak demand periods and incinerator equipment downtime.

Aesthetic and odour and noise control requirements are satisfied by providing enclosed tipping and storage areas from which air will be exhausted into the incinerator units. Space is provided to accommodate an additional stage on the precipitator unit to further reduce particulate emissions and/or scrubbing equipment to remove gaseous contaminants if such upgrading is required in the future. The stack is of the multi-flue type and its height is approximately 235 m above grade to ensure that air quality impact complies with Ontario's standards.

Differentials between plant refuse consumption capability and refuse delivery, and between residue and fly-ash production and transportation for disposal are taken into account by providing refuse, residue and fly-ash storage capacities equal to three times the daily plant incineration capacity. This storage capacity ensures continuous seven-day steam generation with weekday haulage of refuse, residue and fly-ash. To allow uninterrupted burning of refuse, condensing capacity equal to the steam production capacity of one refuse fired boiler is provided, thus permitting uninterrupted operation of the two refuse fired boilers during periods of low steam demand.

With respect to resource recovery, trommels (sieve-like revolving drums) for separating oversized material from the rest of the ash will be installed. The recovery of smaller sized metals necessitates magnetic separation from the "fines" fraction, and the space to install such equipment at a later stage is provided. Fly-ash will be stored separately from incinerator residue to allow for sale of the ash when a market can be developed.

Site Plan and Schematics are shown in Figures 3.1 through 3.3. The Technical Discussion describes the basic elements of a water-walled mass-burning incinerator process. However, it must be emphasized that with each manufacturer of this class of equipment variations do exist. For the functional design, the equipment marketed by Dominion Bridge (Von Roll) has been assumed (Figures 3.2 and 3.3). The selection was based on the high confidence level for the accuracy of the data for cost and performance submitted by this manufacturer. The data is also considered representative of those systems offered by other experienced manufacturers of mass-burning incineration systems.

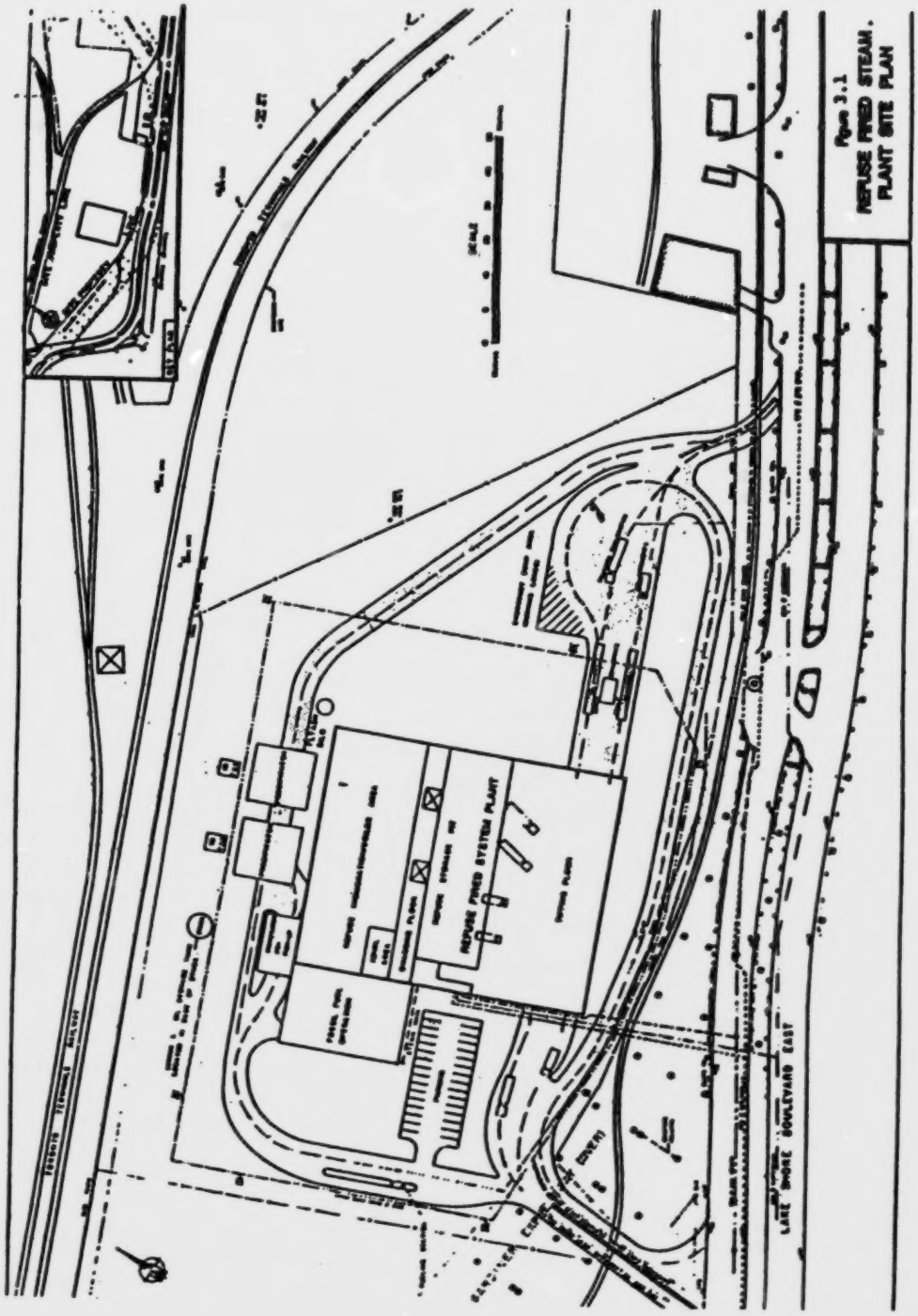


Figure 3.1
REFUSE FIRED STEAM
PLANT SITE PLAN
REFUSE FIRED STEAM PLANT
LAKE SHORE BOULEVARD EAST

3.3 RFSP Performance and Operating Considerations

During operation, the RFSP will incinerate 1270 metric tonnes (1400 tons) of "as received" refuse per day. The plant will contain two refuse fired steam generating units together with two interruptible gas fired supplementary boilers, each capable of producing 100 k lb of steam per hour. The plant's total nominal steam rating capacity is 692 k lb/h while the average nominal steam sendout capacity is 527 k lb/h.

On an annual basis the facility will handle approximately 350,000 tonnes of "as received" refuse hauled to the plant by both collector vehicles and transfer trailer vehicles. It is estimated that 166 collector vehicles and 33 transfer trailers will have to be received per day. The figures for the peak hour are 42 collector trucks and 9 transfer trailers. To handle this number of truck arrivals, 15 tipping bays are provided with a combined tipping capacity of between 45 and 90 vehicles per hour. In addition, on-site queuing space for at least 60 vehicles allows for tipping interruptions and unusually high rates of truck arrival.

The fluctuation in refuse supply and burning rate will be controlled by the number of transfer vehicles directed to the RFSP and therefore no incineration standby capacity is required. Steam generating standby capacity is provided by supplementary conventional boilers and by the other steam generating plants of the integrated district heating system.

Refuse will be received from municipal and private sources on a four and five-day basis respectively. The three-day storage capacity in the refuse pit provides for continuous seven-day operation, i.e. 2230 tonnes will be dumped into the pit on an average receiving day with 1270 tonnes being burned.

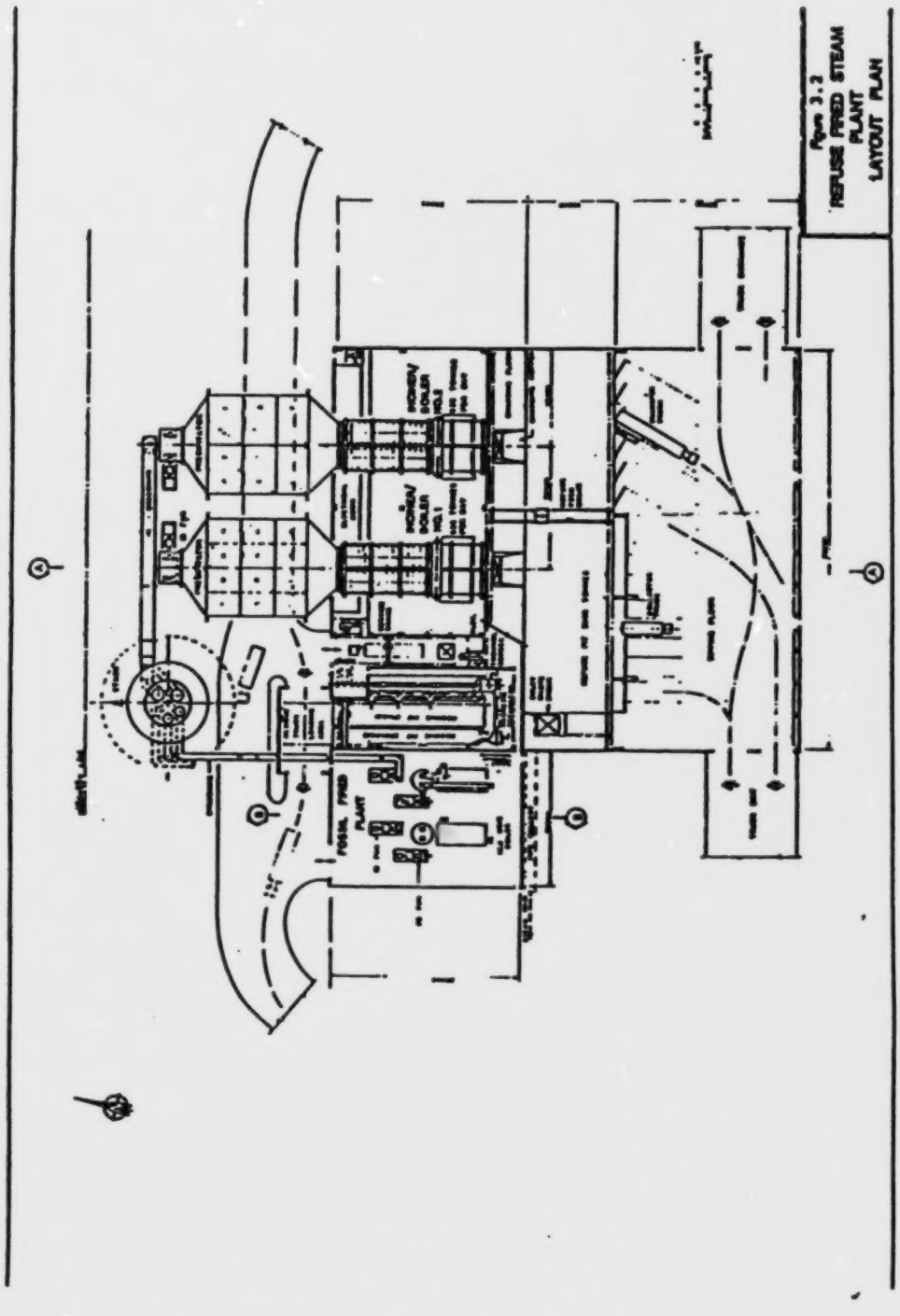
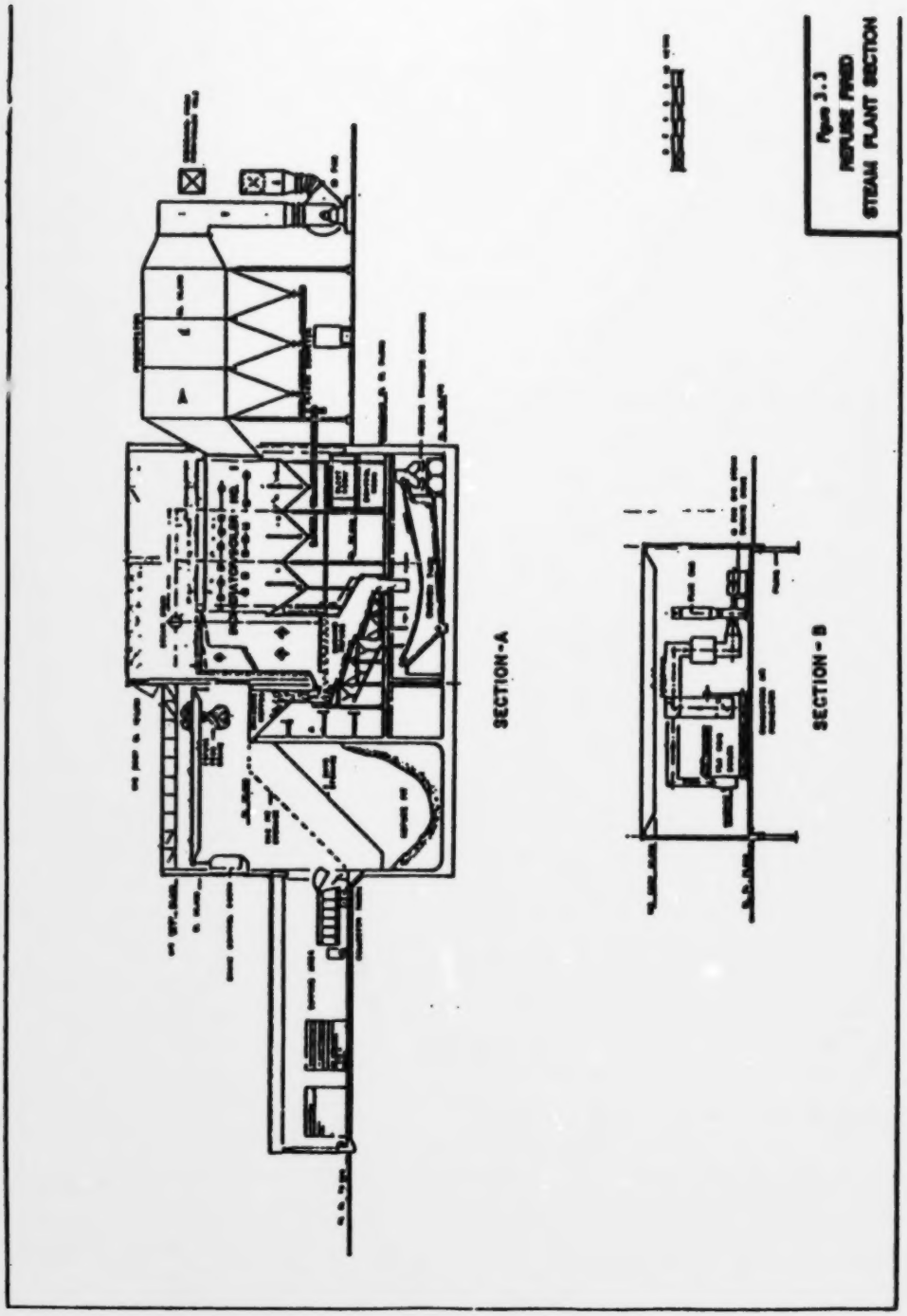


Figure 3.2
REFUSE FIRED STEAM
PLANT
LAYOUT PLAN


SECTION-A
SECTION-B

Residue and precipitator fly-ash disposal operation is carried out on a five-day single shift basis.

The inherent flexibility in refuse collection and transfer systems, and the baseload matching of the steam production at the RFSP of this size (1270 tonnes/day) with the seasonal heating system demand permits the most economical operation of the refuse fired incinerators. During the summer when steam demand is at a minimum (i.e. less than refuse produced steam output), refuse units will be shut down sequentially for a total of 6 weeks for preventive maintenance, resulting in minimal wastage due to excess steam production. The minimum system demand is higher than the sendout of the one incinerator unit in operation. The steam sendout from the incinerator unit will then be supplemented by steam from the interruptible gas fired units. Surplus steam, less than 5 per cent, will be handled by the condenser when both refuse units operate. During the winter, steam demand normally exceeds the sendout capacity of both refuse fired incinerator units, and additional demand will be met by the supplementary interruptible gas fired units and/or by other steam generating plants in the integrated district heating system.

The availability factor for a plant of the mass-burning system varies typically between 70 and 88 per cent. For this study, a factor of 75 per cent was assumed.

At an annual rate of 350,000 tonnes of refuse the plant will incinerate approximately 20% of the refuse generated in and disposed of by Metropolitan Toronto. In order to assure a continuous refuse supply, a "mini-update" of the current Metropolitan Toronto Waste Management Plan identified the solid waste supply options for the proposed RFSP. The mini-update also included the evaluation of physical and economic impacts of the RFSP and other alternatives on the Metropolitan Toronto solid waste disposal system and its users over the 1980-1989 period. The desirability of a RFSP in the vicinity of downtown Toronto was confirmed in "A Waste Management Master Plan for Metropolitan Toronto" (3) prepared for the Municipality of Metropolitan Toronto and the Ontario Ministry of the Environment in August 1980.

3.4 Capital and Annual Operating Cost Estimates

Capital and operating costs were developed based on 1979 costs for the 1270 t/d refuse plant, updated by actual escalation factors to November 1981 and were then projected to a September 1986 start-up date with shakedown completed by January 1, 1987. The operating costs for operation of the plant during 1987 (1st year of operation) and 1991 (5th year of operation) were summarized. The determination of the projected costs was based on 13 per cent for inflation, 17 per cent interest on capital investment and a set of fuel cost increases varying from 27 per cent in 1981 to 13 per cent in 1985 and beyond. Engineering costs were included at 10 per cent. Federal and Provincial Sales Taxes have been determined. That they would apply to a privately owned facility is almost certain; on application however, some, or all, of the sales tax might be waived for a publicly owned plant.

The annual operating costs include the capital financing cost, labour cost, cost of maintenance and supplies, realty taxes and cost of utilities and auxiliary fuel.

The financing cost has been based on 20-year amortization at an interest rate of 17 per cent. Wage rates were determined for each classification or skill level, and total costs estimated on a base of the estimated manpower requirements for the plant.

Revenues considered were those from sale of steam and metals recovered from the incinerator residue. The revenue from steam sales was based on applicable charges to the existing integrated district heating system as well as on quantities sent out specifically from this plant. In addition, the refuse plant was credited with revenue from the disposal of solid wastes.

3.5 Statement of Rationale

Having established the need to replace the Pearl Street steam generating plant with a new remote plant, consideration was given to the use of refuse as prime fuel. Environmental and economic aspects were the decisive factors in choosing refuse rather than coal, while its choice over oil and gas was based on financial considerations. At the same time, the analysis of the environmental impacts of a refuse fired steam plant showed that such a plant incorporating state-of-the-art abatement technology would not impact on its surroundings to any significant degree.

In addition, conservation of the nation's non-renewable energy resources is realized, thereby reducing the demand for both domestic and imported fuels. It is estimated, for example, that the fuel savings in its first year of operation will be equivalent to some 456,000 barrels of oil.

By meeting the baseload steam demand of the integrated district heating system, the plant will provide an alternative disposal site for the Metropolitan Toronto Corporation for a substantial part of the refuse collected within the Corporation's boundaries. This will relieve the dependence on remote landfill sites in adjacent municipalities and will conserve land which could be put to more valuable use. The proposed RFSP complements all other treatment and disposal options for waste management now available to Metro.

The plant will incorporate a metals recovery process. The sale of cans and other ferrous metals will help to offset plant operating costs; incinerator residue can be used as supplemental aggregate for asphalt paving mix, roadbed construction, landfill cover or fill for land reclamation.

In summary, the undertaking of a 1270 tonne per day refuse burning steam generating facility on the Gulf Oil site on the Lake Shore Blvd East at Cherry Street will eliminate the impingement and air pollution problems of the existing fossil-fuel fired Pearl Street Steam Plant, conserve non-renewable resources, reduce Metropolitan Toronto's dependence on landfills, thereby conserving on land use, and will permit the recovery of metals initially, and other materials potentially, for re-use.

4.0 Environment of Proposed Site

4.1 Land Use

The present land use in the immediate vicinity of the proposed plant site, the former Gulf Oil Company lands, consists of a mixture of industrial and transportation uses. The proposed plant site itself is abandoned industrial land and has little or no value as wildlife habitat. There are no trees or shrubs present and no birds or mammals are known to be resident at the site.

Within one kilometre of the proposed site the area is predominantly zoned for a variety of industrial uses. However, two residential areas fall within a one-kilometre radius - a small portion of land east of Broadview Avenue (0.75 to 1.0 km) and the St Lawrence Neighbourhood Development west of Parliament Street (0.5 to 1.0 km). These lands are zoned R.4 (Z.3)and R.3 (Z.5) respectively.

Beyond the one-kilometre radius of the site, one finds a considerable mixture in land use zoning designations with the area north of the proposed site predominantly changing into Residential and Commercial Districts.

4.2 Central Waterfront Planning Area

The proposed facility would be located within the north-west corner of the Port Industrial District which is one out of eight specific planning districts of the Central Waterfront.

The plant does not conflict with either the general priorities for future development of the Central Waterfront Planning Area or the Port Industrial District.

The design of the plant will meet both the intended policies and programmes of the Central Waterfront Planning Committee with respect to landscaping and general appearance. It would also comply with the policy of Council to adhere to the appropriate environmental standards, particularly with respect to the emission of particulates and to runoff as it may affect levels of soil or water contamination.

4.3 Physiography and Geology

(a) Physiography

The property under study for the siting of the proposed steam plant lies within the Iroquois Plain physiographic region. Surficial soils are those of a depositional environment and consist primarily of fine grained silts, clays and organic material; granular glacio-fluvial and alluvial sediments occur in areas of deeper sedimentation.

The surface is essentially level with topographic depressions. The imperfect natural drainage is due both to soil conditions and to poor surface drainage on the property.

(b) Geology

The Toronto area is underlaid with essentially flat-lying Paleozoic sedimentary strata. The bedrock consists primarily of blue and grey Meaford-Dundas shale of the Georgian Bay Formation.

Bedrock under the former Gulf Oil property is generally encountered within 12 m of the ground surface except for a buried bedrock channel which extends through the centre of the property. There the bedrock surface is obscured by 35+ m of superficial deposits.

Structurally the bedrock is very stable and there are no faults or other tectonic features present, although it is prone to severe weathering.

4.4 Hydrology

Findings of previous investigations reveal that the water table (controlled by water levels in the Don River and Keating Channel) is quite level, resulting in very slow or no lateral movement. The water table is normally encountered at least 1.5 m below the land surface and saturated conditions are encountered within 6 m of the ground surface.

In the course of this study, samples of groundwater from boreholes on the site were collected and chemical analyses performed on them. The results show the water to be of poor quality with high levels of organic contaminants such as TKN (Total Kjeldahl Nitrogen), phenol, COD and BOD(5). Interpretation of the results are presented in the Technical Discussion.

There are no surface drainage channels from the site into the Don River or Keating Channel. Both the Don River and the Inner Harbour are already polluted with high levels of suspended solids and phenols, together with fecal coliforms and nutrients.

As to the construction of the proposed plant, major findings are:

- The subsoil horizons have been extensively contaminated, probably due to the operation of the former occupant.

- The nature of the overburden material militates against it being able to support foundation structures for the steam plant without provision of adequate load distributing sub-foundations.

TABLE 4-1

METROPOLITAN TORONTO EMISSION INVENTORY (1969/70) - BY POLLUTANT

Source Type	Sulphur Dioxide	Particulate Matter	Nitrogen Oxide	Carbon Monoxide	Hydro-Carbons
R.L. Hearn G.S.	65.4 (22.5)	7.1 (20.0)	21.5 (19.8)	0.5 (0.1)	0.2 (0.3)
Lakeview G.S.	158.0 (54.3)	2.7 (7.7)	36.4 (33.4)	0.9 (0.2)	0.4 (0.4)
Municipal Incinerators	0.3 (0.1)	4.9 (13.8)	0.4 (0.4)	0.6 (0.2)	0.06 (0.1)
Industrial Sources	24.0 (8.3)	9.5 (26.7)	10.1 (9.3)	1.2 (0.3)	19.3 (22.5)
Autos	1.6 (0.6)	2.2 (6.2)	20.2 (18.6)	387.7 (97.8)	58.7 (68.8)
Railroads	0.2 (0.01)	0.5 (1.4)	1.0 (0.9)	0.3 (0.1)	0.6 (0.7)
Shipping	0.4 (0.1)	0.2 (0.5)	0.3 (0.3)	0.1 (2.1)	0.1 (0.2)
Aircraft	0.1 (2.1)	0.5 (1.5)	0.4 (0.3)	1.0 (0.3)	4.8 (5.6)
Heating - Residential	9.0 (3.1)	1.1 (3.2)	2.7 (2.5)	0.2 (0.1)	0.3 (0.4)
Heating - Apartments	14.9 (5.1)	3.4 (9.5)	7.8 (7.2)	2.3 (0.6)	0.5 (0.6)
Heating - Schools	2.7 (1.0)	0.3 (0.9)	0.8 (0.7)	0.1 (2.1)	0.04 (0.1)
Heating - Com. Bldgs.	9.8 (3.4)	1.5 (4.1)	5.6 (5.2)	0.4 (0.1)	0.2 (0.2)
Small Industries	4.5 (1.6)	0.4 (1.2)	1.2 (1.1)	0.1 (2.1)	0.05 (0.1)
Incineration: Misc.	0.04 (2.1)	1.2 (3.3)	0.4 (0.4)	0.7 (0.2)	0.09 (0.1)
TOTAL[a]	290.9 (31.7)	35.4 (3.9)	108.8 (11.9)	396.3 (43.2)	85.5 (9.3)
GRAND TOTAL	916.9				

NOTES:
1 Percentage figures shown in brackets refer to contribution of each type to a specific pollutant
2 Units are 10^3 tonnes per year

[a] TOTAL figures in brackets are percentage of total pollutants

4.5 Air Environment

The "air environment" of any site is the complex inter-relationship of climatology, dispersion meteorology, and air quality (including noise and odours). In an urban environment each of these major factors is again a combination of a large number of component parts and inter-relationships.

4.6 Meteorology

Toronto, unlike many other large industrial cities, is not subject to severe air pollution because of generally good dispersion of emitted pollutants.

The climate is subject to the westerly flow of continental air masses. The rapid movement of these air masses and the disturbances which may accompany them result in highly variable conditions. Winds are generally strongest in the winter and spring months and weakest in the summer.

When atmospheric conditions are stable and temperature increases with height (an inversion), limited diffusion occurs from time to time. However, pollutant levels could increase to unacceptable levels only if the inversion persisted for more than 48 hours. Fortunately, these conditions seldom persist for extended periods of time in Toronto.

4.7 Sources of Pollutional Emissions

The Ministry of the Environment (MOE) maintains a Metropolitan Toronto Emission Inventory as part of its mandate in air pollution control. The 1969/1970 and 1978 Toronto Emission Inventory Summaries shown in Tables 4-1 and 4-2 indicate that emissions of the major contaminants in Metro Toronto and environs come principally from utility plants, industrial sources and automobiles. Emissions from sources related to this proposal, i.e. incinerators and commercial heating, make some contribution to all major pollutants, but this is well below 10 per cent, with the exception of particulate matter.

In order to ascertain the current status of the four downtown heating plants with respect to the MOE contaminant impingement standards, a 1978 fuels and emissions inventory for these plants was developed and is shown in Table 4-3. With natural gas being the predominant fuel for all four plants in 1978 these particular four plants are responsible for only a small proportion of the total air emissions from the heating of public and commercial buildings. For example, their Sulphur Dioxide contribution is less than 10 per cent of the total due to commercial and public buildings. However, the combination of their central location and close proximity to the major downtown commercial area means that they have a greater than proportionate potential for affecting the downtown air quality. A February 1976 report prepared by the Air Resources Branch of the MOE confirmed that all four plants remain in contravention of impingement regulations for both Sulphur Dioxide and Nitrogen Oxides (calculations for particulate, Carbon Monoxide and Hydrocarbons were not provided).

As expected, the Pearl Street Plant showed the highest calculated contaminant concentrations. The 1978 inventory does not indicate that there has been any material change in plant operations which would affect the 1976 report values.

TABLE 4-2

METROPOLITAN TORONTO EMISSION INVENTORY (1978) - BY POLLUTANT

Source Type	Sulphur Dioxide	Particulate Matter	Nitrogen Oxide	Carbon Monoxide	Hydro-Carbons
R.L. Hearn G.S.	3.6 (2.6)	0.09 (0.4)	4.3 (5.8)	0.2 (0.1)	0.02 (2.1)
Lakeview G.S.	89.2 (64.3)	1.4 (6.6)	12.4 (16.8)	1.0 (0.3)	0.3 (0.4)
Municipal Incinerators	0.4 (0.3)	4.3 (20.3)	0.6 (0.8)	4.3 (1.1)	0.05 (0.1)
Industrial Sources	15.5 (11.2)	5.6 (26.4)	10.8 (14.6)	1.8 (0.5)	26.9 (34.6)
Autos	0.8 (0.6)	3.1 (14.6)	28.5 (38.6)	365.9 (96.3)	46.6 (60.0)
Railroads	0.2 (0.1)	0.5 (2.4)	1.0 (1.4)	0.3 (0.1)	0.6 (0.8)
Shipping	0.4 (0.3)	0.2 (0.9)	0.3 (0.4)	0.1 (2.1)	0.1 (0.1)
Aircraft	0.1 (0.1)	0.08 (0.4)	1.3 (1.8)	3.3 (0.9)	1.4 (1.8)
Heating - Residential	13.0 (9.4)	2.1 (9.9)	3.5 (4.7)	1.2 (0.3)	0.7 (0.9)
Heating - Apartments	3.2 (2.3)	1.1 (5.2)	2.9 (3.9)	0.3 (0.1)	0.1 (0.1)
Heating - Schools	2.6 (1.9)	0.3 (1.4)	1.1 (1.5)	0.08 (2.1)	0.05 (0.1)
Heating - Com. Bldgs.	6.9 (5.0)	1.6 (7.6)	5.6 (7.6)	0.5 (0.1)	0.4 (0.5)
Small Industries	2.8 (2.0)	0.4 (1.9)	1.3 (1.8)	0.07 (2.01)	0.05(0.1)
Incineration: Misc.	0.05 (2.1)	0.7 (3.3)	0.4 (0.5)	0.7 (0.2)	0.3 (0.4)
TOTAL*	138.0 (20.07)	21.2 (3.07)	73.9 (10.69)	379.8 (54.93)	77.7 (11.24)
GRAND TOTAL	691.4				

NOTES:
1 Percentage figures shown in brackets refer to contribution of each source type to a specific pollutant
2 Units are 10^3 tonnes per year

* TOTAL figures in brackets are percentage of total pollutants

TABLE 4-1

TORONTO DOWNTOWN HEATING PLANTS
FUELS AND EMISSIONS INVENTORY - 1978

Plant	Annual Fuels Fired				Annual Emissions (tonnes)				
	Natural Gas ($ft^3 x10^6$)	#6 Oil (I Gal)	#4 Oil (I gal)	#2 Oil (I gal)	Sulphur Dioxide	Particulate	Nitrogen Oxide	Carbon Monoxide	Hydro-Carbons
Pearl Street	2 001 025	500 000[1]	-	-	35.6	16.7	663.9	16.8	1.2
Hospitals	1 029 180	-	-	63 316[2]	2.7	7.1	327.5	8.1	0.5
University of Toronto	1 136 266	96 314[3]	-	130 395[3]	16.5	8.7	365.5	9.4	0.6
Queen's Park	431 000	-	51 000[4]	-	4.0	3.3	138.5	3.5	0.2
TOTAL	4 597 471	596 314	51 000	193 711	58.8	35.8	1 495.4	37.8	2.5

NOTES
Emissions based on U.S. EPA Emission Factors

1 Sulphur content: 0.82%
2 Sulphur content: 0.5%
3 Sulphur content: typically 1.35%
4 Sulphur content: 0.9%

4.8 Air Quality, Noise, and Odours

(a) Air Quality

The MOE currently operates continuous air quality monitoring instrumentation at 15 locations in Metropolitan Toronto. Monitored pollutants include Sulphur Dio. ide, Soiling Index (COH), Ozone, Nitrogen Dioxide, Nitric Oxide (NO) and Nitrogen Oxides.

These pollutants are complemented by measurements of total suspended particulates (TSP) monitored by the Federal Department of Fisheries and Environment in the National Pollution Surveillance (NAPS) programme.

Of all pollutants monitored, only Sulphur Dioxide shows a significantly decreasing trend (more than 50 per cent reduction) since the early 1970's. This trend is due to the fuel sulphur limitation regulations in Metro phased in during the early 1970's. By 1977, annual average Sulphur Dioxide levels were well below the criteria in Metro and the overall range of hourly values had also decreased.

Although particulate emissions have fallen since 1969/1970, there are no consistent trends in TSP values and Soiling Index. Recently there have been increasing trends at some stations and violation of the 24-hour criteria. However, annual objectives are seldom exceeded.

There is no annual criteria established for Nitrogen Dioxide emission yet. Hourly and 24-hour criteria values are rarely exceeded.

Levels of Carbon Monoxide and Hydrocarbons are well below criteria or close to anticipated natural levels respectively. No significant trends have been established.

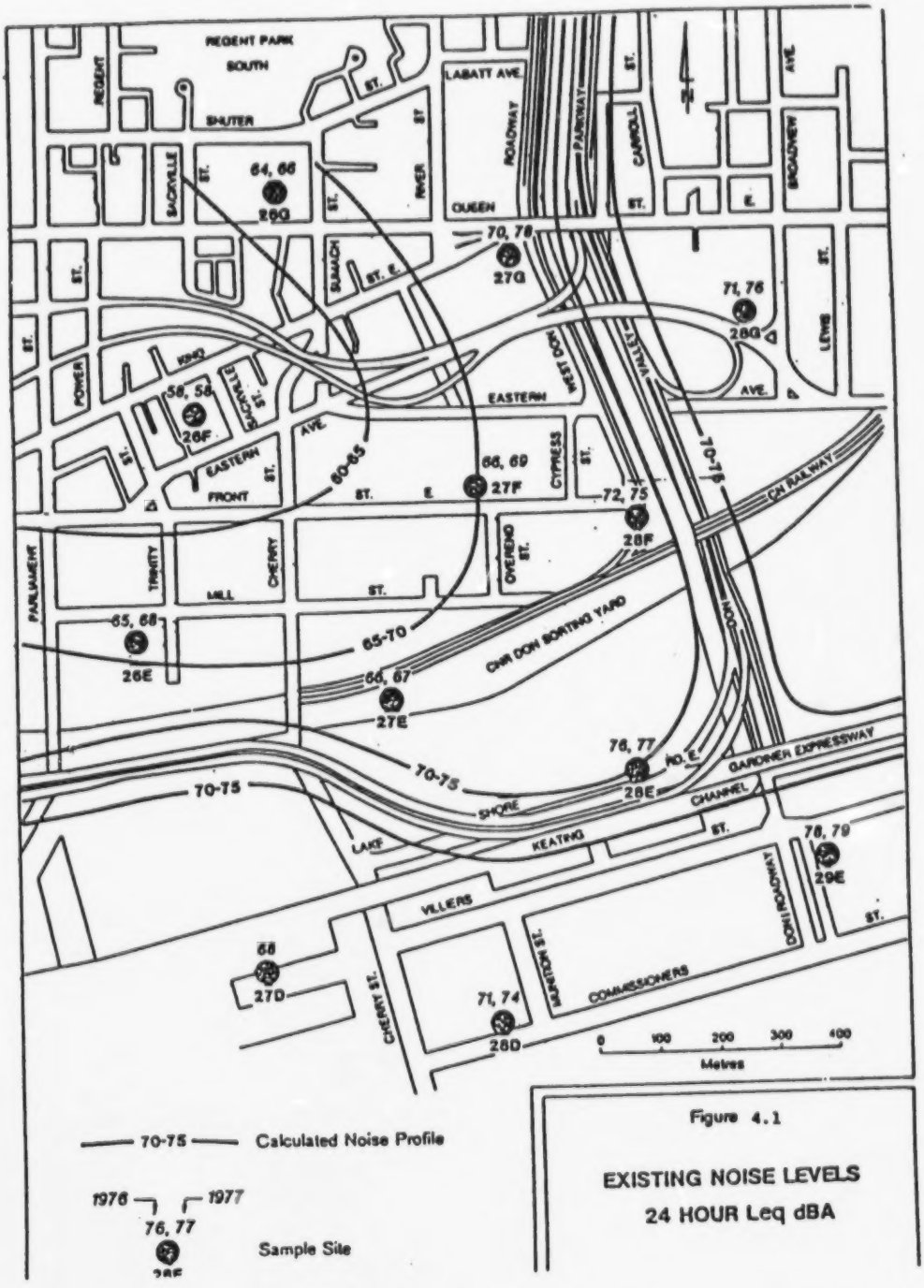


Figure 4.1

EXISTING NOISE LEVELS
24 HOUR Leq dBA

(b) Existing Noise Environment

Noise measurements have been made as a part of the City of Toronto Noise Control Programme since the early 1970's. From these recorded data, 24-hour Leq (equivalent average level) values for grid points in the area around the proposed steam plant site were used to draw approximate noise contours. Grid points and contours are shown on Figure 4.1.

The contours indicate that the existing noise climate in the vicinity of the site is high and that the dominant noise source is the expressway system comprising the Don Valley Parkway and the Frederick G. Gardiner Expressway.

In order to determine the noise level from future truck traffic supplying refuse to the RFSP, traffic data in the vicinity of the site were reviewed and complemented by recent counts at various sections of the roads surrounding the site. Traffic counts for the 24-hour period and the 2-hour period from 10:00 a.m. to 12:00 noon (maximum refuse truck arrivals) were collected, to be used as input to a model developed by the Ontario Ministry of Transportation and Communications to predict future noise levels.

(c) Existing Odour Sources

Several of the industrial plants in the vicinity have a history of being odour-emitting sources and, although efforts have been made by the plants concerned to minimize their odour emissions, the area is still not free of odorous emanations. Specifically, the rendering plant at 334 Lake Shore Blvd East is considered the most serious nearby odour source. Other perceivable and more significant odours generated in the vicinity of the site emanate from paint solvents, sulphonation, melting of oily scrap, etc.

4.9 Design Constraints on Stack Height

Ontario Regulation 15 states that calculated concentrations of pollutants emitted from point sources (e.g. the plume from a plant stack) shall not exceed stipulated half-hour point of impingement concentration levels. A point of impingement can be the ground or any elevated structure. Therefore, in order to protect existing or future buildings, the stack height has to be designed accordingly. The existing and future building profiles presented in Figure 4.2 relate to the north and west of the site. There are no specific height restrictions for the development in the east and south of the proposed plant site. As Figure 4.2 indicates, the future profile is lower than the existing profile, the latter therefore being the critical profile for the determination of the necessary stack height.

With respect to Air Traffic constraints, the boundary for an obstruction-free flight path set by the Department of Transport (DOT) Civil Aviation Branch, is the imaginary east-west line through the stack of the Hearn Plant. Since the proposed site of the steam plant is approximately 1 km north of this line, the stack will meet the DOT criterion.

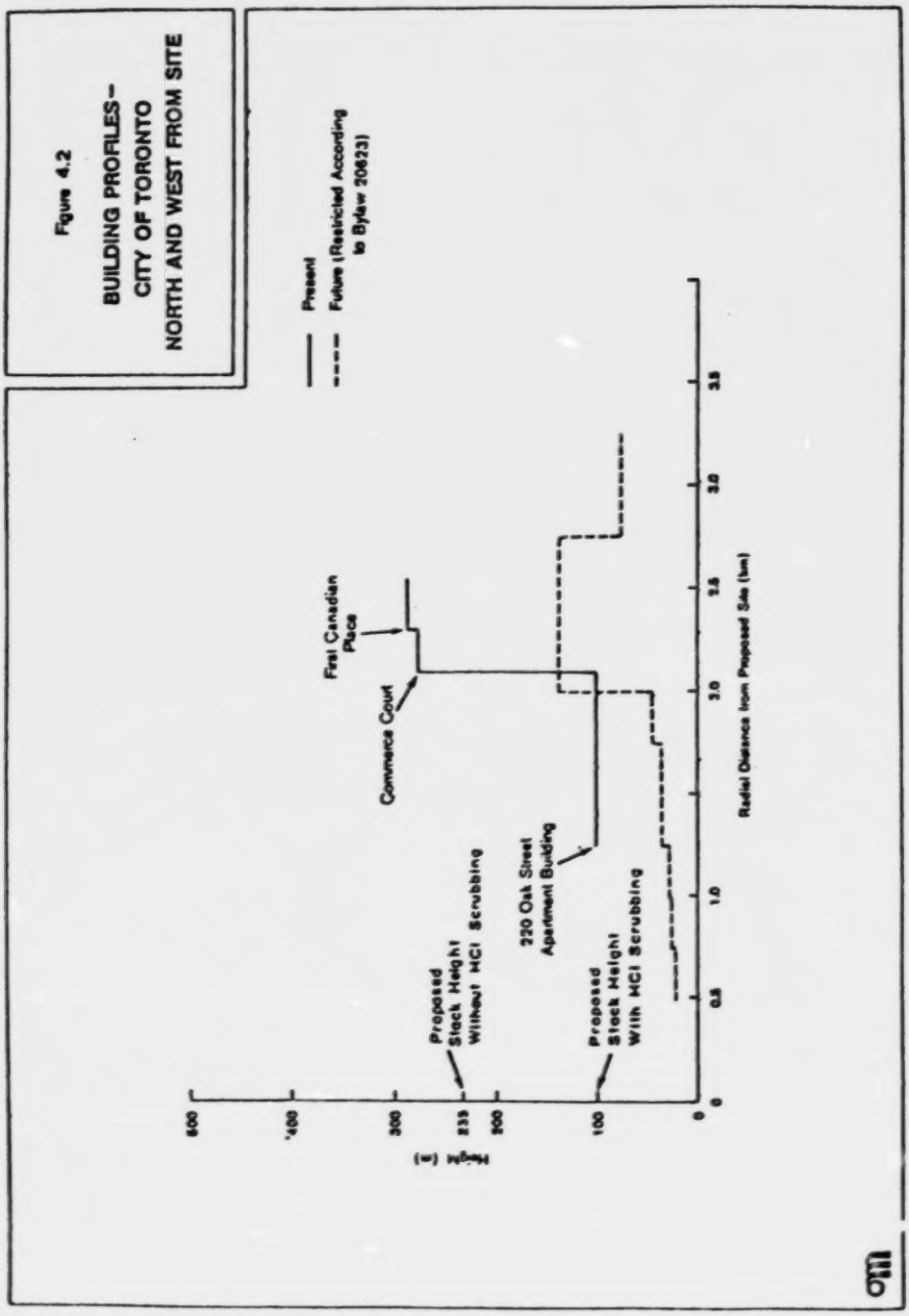


Figure 4.2
BUILDING PROFILES—
CITY OF TORONTO
NORTH AND WEST FROM SITE
Present
Future (Restricted According to Bylaw 20623)
First Canadian Place
Commerce Court
220 Oak Street Apartment Building
Proposed Stack Height Without HCl Scrubbing
Proposed Stack Height With HCl Scrubbing
Height (m)
600
400
300
235
200
100
0
0.5
1.0
2.0
2.5
3.0
3.5
Radial Distance from Proposed Site (km)

5.0 Environmental Impacts and Mitigating Measures

For the purpose of investigating the environmental impacts of this new plant, the environment surrounding the proposed site for the steam generating plant was divided into the following four sub-environments:

- Natural environment and land use
- Geologic and hydrologic environment
- Air environment
- Aquatic environment

5.1 Natural Environment and Land Use

The site itself has little vegetation and no significance as wildlife habitat, therefore physical changes resulting from development will have no detrimental consequences in terms of the natural environment.

Of potential concern are the effects of gaseous emissions, the traffic flow effects, aesthetic impact of an exhaust stack, odours, noise, and disruptions during construction.

Gaseous emissions from the stack will have no effects on trees or other vegetation since concentrations at ground level will be much less than specified by the guidelines. The low concentration results from the facility's high exhaust stack which is required in order to comply with impingement standards at elevations well above ground level.

The effect on existing traffic flow by trucks delivering fuel to the proposed plant (oil, refuse) was investigated. The RFSP will generate approximately 220 trips daily, with some 30 per cent of the volume occurring between 10:00 a.m. and 12:00 noon. Trucks will normally enter and leave the site in the period between 10:00 a.m. and 4:00 p.m. and since the traffic flow on the adjacent arterials during this period is relatively low, the proposed plant will not have a congesting effect.

Regarding aesthetic impacts, the appearance of the proposed plant will be an improvement of the site with the exception of the exhaust stack which is 235 m high in order to comply with the Ministry of the Environment (MOE) standards for emitted contaminants. However, the stack will be comparable in height to others within the Port Industrial District. Odours, debris and noise originating from the site will be minimized by measures described under "Air Environment".

—

Table 5-1

Selected Ontario Air Contaminant Standards

(half-hourly values at single source)

Contaminant	Calculated Impingement Standard (ug/m3)
Berrylium	0.93
Carbon Monoxide	6000
Chromium	30
Hydrogen Chloride	100
Lead	10
Mercury	5.0
Nickel	5.0
Nitrogen Oxides	500
Silver	3
Sulphur Dioxide	830
Suspended Particulate Matter	100
Zinc	100

Note: ug/m3 - micrograms per cubic metre

5.2 Geologic and Hydrologic Environment

Construction and operation of a steam generating facility has potential impact upon the geologic environment by influencing soil erosion rates and the groundwater regime. The latter includes a change in recharge rates, a change in the direction of groundwater movement and the possible contamination of the groundwater body.

However, precautions during construction, sound design for storage areas (oil or refuse respectively), and appropriate operational procedures will reduce or eliminate the possibility of accidental spillage or leakage of contaminants such as stored oils, residue wastewaters or contaminated precipitation runoff.

5.3 Air Environment

The air pollution impact of the alternative refuse or fossil fuel fired options for the proposed steam plant is the most important environmental factor to be considered. As a first step in examining the proposal, applicable existing legislation was reviewed. This was followed by a general review of alternative fuels and emission controls, an air emission inventory and stack height criteria for the RFSP and FFSP alternatives.

The investigation included pollutant dispersion and noise modelling as well as an examination of the impact on air quality by odours, and upsets and accidents. Finally, construction and abandonment impacts, as well as monitoring and surveillance were considered.

5.3.1 Legislation Requirements

For the proposed project, the primary and most extensive set of requirements is that of the Ontario Ministry of the Environment (MOE). The MOE has the power to enforce the Environmental Protection Act (1971) and associated regulations which specify air quality standards and air quality criteria for the Province of Ontario. The Act also recognizes sound and vibration as contaminants of the natural environment. Selected Ontario air contaminant standards and air quality criteria are listed in Tables 5-1 and 5-2 respectively.

The federal government's Clean Air Act 1971 provides a mandate to establish federal air quality objectives, regulatory programmes, and advisory services. The federal government has developed specific guidelines for industrial processes, and is currently developing guidelines for refuse incinerators and a number of other processes. Those objectives relevant to this study are shown in Table 5-3.

The City of Toronto has had a comprehensive noise by-law (By-law No. 44-75) for several years. It is intended to control noise from a variety of sources such as vehicles, service tools, power fans and cooling towers, and construction and demolition operations.

As part of the general mandate given to the U.S. Environmental Protection Agency under the American Clean Air Act, the Agency was required to develop performance standards for new sources. Regarding municipal incineration, the limitation concerned particulate emission from new incinerators. A 1978 update of the standards supports electrostatic precipitators as the best control technology and recommends the incorporation of an opacity standard in legislation.

Table 5-2

Selected Ontario Air Criteria

(total of pollutant at any location)

Contaminant	Ontario Criteria (ug/m3) 1 hour Average	24 hour Average	Annual Average
Suspended Particulate	-	120	60 geometric mean)
Soiling (COH/1000 ft)	-	1.0	0.5
Sulphur Dioxide (SO2)	690 (0.25 ppm)	275 (0.10 ppm)	55 (0.02 ppm)
Nitrogen Dioxide	400 (0.20 ppm)	200 (0.10 ppm)	-
Carbon Monoxide (CO)	36200 (30 ppm)	15700 (8h) (13 ppm)	-

Notes: ppm - parts per million
ug/m3 - microgramsper cubic metre

TABLE 5-3

SELECTED CANADA AMBIENT AIR QUALITY OBJECTIVES

Contaminant		Maximum Desirable Level		Maximum Acceptable Level		Maximum Tolerable Level (proposed)	
		(µg/m³)	(ppm)	(µg/m³)	(ppm)	(µg/m³)	(ppm)
Sulphur Dioxide	(Annual)	30	0.02	60	0.02	-	
	(24-h)	150	0.06	300	0.11	800	0.31
	(1-h)	450	0.17	900	0.34	-	
Suspended Particulate Matter	(Annual)	60		70		-	
	(24-h)	-		120		400	
Nitrogen Dioxide	(Annual)	60	0.03	100	0.05	-	
	(24-h)	-		200	0.11	300	0.16
	(1-h)	-		400	0.21	1000	0.53
Sulphur Dioxide (24-h) times Particulate Matter (24-h)		-		-		125 000(µg/m³)²	

NOTES:
ppm - parts per million
µg/m³ - micrograms per cubic metre

5.3.2 Emission Inventories and Stack Height Determinations

The specific fuels examined in completing emission inventories were refuse, coal, residual (No. 6) oil, distillate (No. 2) oil, and natural gas. The emission quantities for the major air quality contaminants measured by the MOE, i.e. Suspended Particulates, Nitrogen Oxides and Carbon Monoxide, were determined by using USEPA Emission Factors, revised to May 1978. These pollutant quantities were determined for a nominal steam output of 100 k lb/h for purposes of comparison.

Even with 98 per cent removal of particulate matter for refuse and coal firing, coal still produces the highest index value. Natural gas has the lowest index value as can be seen in Table 5-4 which shows index values for coal and natural gas as well as values for distillate oil, residual oil, and refuse.

The basic emission index values in Table 5-4 have been used with the fuel quantities developed for both the 1270 t/d RFSP and the 100 per cent fossil fuel fired steam plant to derive detailed peak rates and annual emission quantities for the two principal alternatives. The results, tabulated in Table 5-5, were used to calculate stack heights and to simulate the air quality impact of the proposed plant.

The MOE dispersion model used to establish stack heights includes an equation for calculating plume rise, and equations for calculating dispersion under preselected conditions. The equations for elevated sources were used to define stack heights which would meet the impingement standards for all emission parameters investigated (Table 5-5).

The use of multi-flued stacks ensures that the plume will not downwash during periods of very low plant load and is therefore environmentally preferable to a single-flued stack.

The results of modelling all possible combinations of the fossil fuel and refuse fired units of the RFSP showed that a stack extending 235 m above grade would be required to meet the impingement concentrations for all contaminants investigated - unscrubbed HCl (Hydrochloric Acid) being the height determining parameter.* In the case of the fossil fuel fired plant alternative, a 105 m stack was found to be sufficient to meet the standards when firing distillate fuel oil as backup to the interruptible natural gas supply.

*Note: Since the 1979 investigations into the height requirements of the stack, based on dispersion of the unscrubbed HCl, recent technology has evolved which makes use of HCl scrubbing. This being the case, a review of HCl removal processes would be undertaken at the time of detail design of the Plant, with the possibility of reduction in stack height to 100 m due to inclusion of scrubbers.

TABLE 5-4

PEAK EMISSIONS FOR A STEAM PLANT UTILIZING ALTERNATIVE FUELS
(Basis: 100 000 lb steam/h)

Emission Parameter	Refuse Plant @ 285 t/d		Coal Fired Plant @ 4.5 t/h		Residual Oil Fired Plant @ 2963 L/h		Distillate Oil Plant @ 3240 L/h		Natural Gas Fired Plant @ 3.6 Mm^3/h	
	g/s	Index	g/s	Index	g/s	Index	g/s	Index	g/s	Index
Particulate Matter	1.0 @ 98% effcy.	0.010	2.2 @ 98% effcy.	0.022	1.8	0.018	0.22	0.002	0.24	0.002
Sulphur Dioxide	4.1	0.005	35.8	0.043	23.2	0.028	6.4	0.008	0.01	0.00
Oxides of Nitrogen	4.9	0.010	11.3	0.023	10.3	0.021	11.3	0.023	11.1	0.022
Hydrocarbons	2.5	1	0.2	1	0.1	1	0.11	1	0.02	1
Carbon Monoxide	57.8	0.010	0.6	0.00	0.5	0.00	0.5	0.00	0.3	0.00
INDEX TOTAL		0.035		0.088		0.067		0.033		0.024

NOTE:
1. The regulations do not specify a general short term hydrocarbon or organic standard.

TABLE 5-5

EMISSION RATES AND STACK PARAMETERS FOR THE SELECTED ALTERNATIVES

	Alternative 1 (2 Refuse Units, 2 Fossil Units)		Alternative 2 (4 Fossil Units)	
Fuel Firing	Peak Rate[1]	Annual Quantity[2,3]	Peak Rate[1]	Annual Quantity
Refuse	1270 t/d	347 680 tonnes	-	-
Gas	7.1×10^3 m³/h	23×10^6 m³	21.4×10^3 m³/h	90.8×10^6 m³
Fuel Oil	5.9×10^3 L/h	1991×10^3 L(#6)	19.5×10^3 L/h	6538×10^3 L(#2)

	Peak Rate		Annual	Peak Rate[5]	Annual
Emissions	Refuse Units (g/s)	Fossil Units[4] (g/s)	(tonnes)	(g/s)	(tonnes)
Particulate	8.8	3.6	218	1.4	23
SO_2	18.4	46.5	491	46.0	56
NO_x	22.0	20.7	804	68.0	1110
CO	257.0	1.0	6092	3.3	29
HCl	29.0	-	696	-	-

Stack Parameters	Refuse Units	Fossil Units	Fossil Only
No. of Units	2	2	4
Exit Velocity (m/s)	20	20	20
Flue Diameter[6] (m)	2.33	1.11	1.35
Exit Temperature (°C)	232	204	204

NOTES:
1. Peak rate calculated assuming all units are firing at full rate
2. Annual quantity for Alt. 1 based on 75% availability of refuse units
3. Annual quantity assumes fuel oil is burned for 336 hours per year when gas supply interrupted
4. Peak rate occurs with #6 oil firing
5. Peak rate occurs with #2 oil firing except for particulate for which peak rate occurs with natural gas firing
6. Values given are for individual flues for each unit

5.3.3 Impacts During Plant Operation

(a) Air Pollution by Stack Emissions

Investigation and analysis of concentrations of air contaminants were carried out by modelling air quality for the following alternatives:

1. RFSP without incorporation of HCl scrubbing. The impacts of HCl emissions being controlled by dispersion through an elevated stack (235 m).

2. RFSP incorporating a dry scrubber to remove a minimum of 70 per cent of the HCl emission and a shorter stack (100 m) which would disperse the residual emissions.

3. FFSP; emissions being dispersed through an elevated stack (105 m).

Regarding the refuse fired component, design according to the state-of-the-art and optimum control at source will reduce emission rates of Carbon Monoxide, unburned Hydrocarbons, and Nitrogen Oxides to better than acceptable standards. Although particulate emissions can also be reduced substantially by proper design and control at source, electrostatic precipitator units designed to remove 98 per cent of total particulate matter will be provided to ensure that emission rates will meet Federal guidelines.

The emissions of a number of metals, including Lead, Mercury, Beryllium, Zinc and Cadmium can be expected not to exceed their respective standards subject to the overall particulate level being below the standard of 100 microgrammes/cubic metre.

Oxides of Sulphur and Hydrochloric Acid emissions are dependent on refuse characteristics, and their emission rates are virtually independent of plant design parameters. Fortunately, the sulphur content of municipal waste is not high enough to cause concern. However, emissions of HCl, which arise from the chloride content of waste, do represent a potential problem. Although wet scrubbing has proved to be an effective process to reduce HCl emissions, it is a very expensive process and it brings other disadvantages such as corrosion problems, production of sludge and a dense water plume. Because of this plume and the other factors and the plant's close location to the Gardener Expressway and the Don Valley Parkway, dispersion via a high stack is proposed.

Recently, concern has been expressed regarding the possible emission of trace amounts of highly toxic organic pollutants as a consequence of large-scale combustion of municipal wastes for recovery of energy. In the United States, the Environmental Protection Agency in late November, 1981 released a report (7) indicating that an evaluation of five resource recovery facilities produced results suggesting that the existing tetrachlorinated dioxin (TCDD) emissions did not present a public health hazard to residents living in the immediate vicinity of the plants.

In 1981, the American Society of Mechanical Engineers (ASME) also issued a report (8) on Dioxin from Combustion Sources which confirmed that polychlorodibenzo dioxins (PCDDs) are probably present in effluents from most, if not all, municipal and industrial waste incinerators. There was insufficient data to establish whether PCDDs are generally present in fossil-fuel fired combustion source effluents.

It was also indicated that in both municipal and industrial waste combustion facilities the specific and highly toxic 2,3,7,8-TCDD isomer does not appear to be a major component relative to the total quantity of tetra-CDDs, which are themselves trace components of the emissions.

Since no information is yet available regarding acceptable dioxin levels, the study attempted to establish a perspective on the order of magnitude of the problem posed by the possible emission of dioxins and related the degree of risk posed by the presence of dioxins to the risks of other life activities, both voluntary (e.g. drinking, smoking) and involuntary (e.g. earthquake, tornadoes, floods, influenza, accidents). The result was that the current indicated level of cancer risk (1 in 1,000,000) due to potential dioxin emissions at energy-from-waste plants, is several orders of magnitude less than the health risks to which the general public is subject from many other types of exposure.

This again conforms to EPA's findings that TCDD emissions from the combustion of municipal wastes are "far below the level of a credible health risk". Indeed, the current study on Pesticides and Industrial Organic Chemicals by the Sub-Committee of the Associate Committee on Scientific

Criteria for Environmental Quality of the National Research Council of Canada will shortly provide further classification on the potential hazard of dioxin. Any new information on TCDD emissions, if relevant, will be taken into consideration for the final design of the proposed plant.

In order to assess the effects of the proposed plant on polychlorinated biphenyl (PCB) ambient concentrations, reference was made to a recent study for the proposed London Victoria Hospital Energy-from-Waste facility (9). Its conclusions, based amongst others on a study (10) comparing emissions of PCB's from municipal incinerators, were that the plant should have no difficulty in meeting the Ontario tentative standard concentration for point of impingement of 0.45 nanogrammes/cubic metre.

With respect to the fossil fuel fired boilers the most serious impact will arise from Sulphur Oxide emissions from oil firing during gas supply interruption. The sulphur content of this oil is regulated in Metro, but even so, tall stacks are required to ensure that impingement concentrations are acceptable.

TABLE 5-6

MAXIMUM IMPINGEMENT SUMMARY FOR THE COMBINED REFUSE/FOSSIL-FUEL FIRED STEAM PLANT (RFSP)[2]

	Modelled Concentrations ($\mu g/m^3$)						
	Maximum Ground Level Concentrations		Maximum Elevated Impingement[1]		Adverse Dispersion		
Contaminant	Expanded MOE Model	USEPA Model	MOE Model	USEPA Model	Trapping Model	Inversion Breakup Model	Ontario Standard
Particulates	3	2	15	5	2	13	100
SO_2	15	8	60	20	18	104	830
NO_x	15	8	70	25	12	68	500
CO	180	90	830	260	73	412	6000
HCl	20	10	95	30	8	47	100

NOTE:
1. Maximum Impingement occurs at First Canadian Place
2. With 235 m multi-flue stack

(b) Dispersion Modelling

The Ontario impingement regulations are based on a specific selected mathematical dispersion model. In this model, a conservative plume rise equation has been combined with dispersion parameters representative of normal meteorological conditions and specific time averaging factors to produce results which can be compared to stipulated contaminant concentrations. Short-term concentrations and impingement, and adverse dispersion conditions were analysed to predict maximum concentrations by applying four other models more suitable for these conditions.

Tables 5-6, 5-7 and 5-8 summarize the maximum impingement concentration results for the three alternatives investigated. With the exception of elevated impingement concentration for HCl, and Nitrogen Oxides from the FFSP under inversion breakup, maximum concentrations of all contaminants for normal and adverse dispersion conditions are only a fraction of permissible levels.

For all three cases investigated, long-term air quality modelling predicts annual average concentrations for all contaminants to be less than one microgram per cubic metre. The impact on existing air quality will therefore be negligible.

As a supplement to the above-described modelling, the MOE Air Resources Branch has undertaken to use the Ministry's Regional Air Quality Simulation Model to confirm the minimal effect of the proposed alternatives on air quality.

(c) Noise and Odours

During normal RFSP operations, noise will be generated by in-plant equipment and by refuse trucks arriving and leaving the site. The proposed complete enclosure of the refuse receiving and transfer area, and the provision of a steam condenser will reduce the noise impact of all potential sources and, given the relatively high background noise levels due to traffic on the Gardiner Expressway, Lake Shore Boulevard and the Don Valley Parkway, it is most unlikely that these RFSP sources will cause complaint.

Future maximum noise levels under various conditions were predicted using the Ministry of Transportation and Communications (MTC) model. A comparison of future with existing noise levels is shown in Table 5-9.

Regarding odour nuisance at the RFSP, this will be eliminated by drawing air for combustion from the refuse tipping and storage areas as well as by enclosing the refuse receiving and transfer areas.

(d) Upsets and Accidents

Upsets and accidents can be minimized but their possibility can not be eliminated. Some emissions of Smoke, Soot, CO (Carbon Monoxide), Hydrocarbons and Steam might occur. None of the above emissions should be seen as a serious constraint since their infrequent occurrence followed by immediate ameliorating action should ensure that they are not a significant nuisance.

TABLE 5-7

MAXIMUM IMPINGEMENT SUMMARY FOR THE COMBINED REFUSE/FOSSIL-FUEL FIRED STEAM PLANT (RFSP) WITH HCl SCRUBBING[3]

	Modelled Concentrations ($\mu g/m^3$)						
	Maximum Ground Level Concentrations		Maximum Elevated Impingement[1]		Adverse Dispersion		
Contaminant	Expanded HOE Model	USEPA Model	HOE Model	USEPA Model	Trapping Model	Inversion Breakup Model	Ontario Standard
Particulates	9	3	25	8	4	23	100
SO_2	140	40	420	110	26	162	830
NO_x	50	15	160	40	37	228	500
CO	6	2	20	5	200	1244	6000
HCl	(2)	(2)	(2)	(2)	7	42	100

NOTES:
1. Maximum Impingement occurs at the Oak Street apartment building.
2. HCl concentrations not determined, since the critical case determining the 100 m stack requirement occurs when the refuse fired incinerators are not operating.
3. With 100 m multi-flue stack

TABLE 5-8

MAXIMUM IMPINGEMENT SUMMARY FOR THE FOSSIL-FUEL FIRED STEAM PLANT (FFSP) ALTERNATIVE[2]

	Modelled Concentrations ($\mu g/m^3$)						
	Maximum Ground Level Concentrations		Maximum Elevated Impingement[1]		Adverse Dispersion		
Contaminant	Expanded HOE Model	USEPA Model	HOE Model	USEPA Model	Trapping Model	Inversion Breakup Model	Ontario Standard
Particulates	1	1	4	2	2	10	100
SO_2	60	30	340	190	50	313	830
NO_x	9	5	45	27	73	463	500
CO	3	2	15	8	4	22	6000

NOTE:
1. Maximum Impingement occurs at First Canadian Place
2. With 100 m multi-flue stack

Table 5-9

Comparison of Existing and Future Noise Levels

Road Section	Existing Level (DBA) 2-hour	24-hour	Future Level (dBA) 2-hour	24-hour
Cherry Street between Mill and Front	56	53	58	54
Eastern Avenue				
- east of Cherry	62	60	64	60
- west of Cherry	64	60	64	60
- bridge over Don	68	66		
Don Valley Parkway/ Gardiner Expressway	74	72	74	72

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5.3.4 Construction and Abandonment Impacts

Fugitive dust emissions and noise generated by construction and/or demolition activities will be subject to the usual control procedures and preventive measures and will not exceed acceptable levels for an industrial area.

In the event of plant demolition there will be no residual pollution impacts associated with the proposed use.

5.3.5 Monitoring and Surveillance

In addition to the routine surveillance by the Ministry of the Environment and plant personnel it is recommended that the outlet loading of the electrostatic precipitators be retested 6 to 12 months after commissioning. Continuous particulate monitoring and annual stack tests for particulate matter and HCl should be standard operating procedure for the refuse units.

Particulate samples should be retained for heavy metal analyses. Initial testing to ascertain actual emission rates of Sulphur Dioxide, Nitrogen Oxides, total Hydrocarbons and Carbon Monoxide would be prudent.

TABLE 5-10

SUMMARY OF METRO TORONTO SEWER BY-LAW REGULATIONS JUDGED APPLICABLE TO DISCHARGES FROM THE STEAM PLANT

Item	Sanitary or Combined Sewers	Storm Sewers
Temperature (°C)	Not greater than 65.6	Not greater than 65.6
pH	Not lower than 5.5 or higher than 10.5	Not lower than 5.5 or higher than 9.5
Suspended Solids (mg/L)	Not exceeding 400	Not exceeding 30 or which are incapable of passing a 1/4 in. screen
BOD (mg/L)	Not exceeding 300	Not exceeding 20
Other Restricted Materials	Gasoline, benzene, naphtha, fuel oil, or other inflammable or explosive matter.	Gasoline, benzene, naphtha, fuel oil, or other inflammable or explosive matter.
	Ashes, cinders, sand, mud, straw, shavings, metal, glass, rags, feathers, tar, plastic, wood cellulose, pounch manure or any other solid or viscous matter that is not dissolved in a liquid, of a type or quantity capable of causing obstruction to the flow in the sewer system.	Ashes, cinders, garbage, sand, mud, straw, shavings, metal, glass, rags, feathers, tar, plastic, wood, cellulose, pounch manure or any other solid or viscous matter.
	Carbon bisulphide, hydrogen sulphide, ammonia, trichloroethylene, sulphur dioxide, formaldehyde.	Carbon bisulphide, hydrogen sulphide, ammonia, trichloroethylene, sulphur dioxide, formaldehyde, chlorine, bromine, pyridine, or any other matter that has or may cause an offensive odour.
	Waste water containing any of the materials set out hereunder in Column I in excess of the concentration respectively set out opposite each material in Column II.	Waste water that is likely to cause the death of or injury to any person, fish, animal, bird or fowl, or that is likely to cause damage to any property.
	Waste water containing any of the materials set out hereunder in Column I in excess of the concentration	

I	II
Phenolic Compounds	1 mg/L
Cyanide	5 mg/L
Sulphides	5 mg/L
Cadmium	8 mg/L
Copper	8 mg/L
Nickel	10 mg/L
Chromium	10 mg/L
Lead	10 mg/L
Zinc	10 mg/L
Chlorides measured as Cl	1500 mg/L
Sulphates measured as SO_4	1500 mg/L

I	II
Phenolic compounds	0.04 mg/L
Cyanide	0.10 mg/L
Cadmium	1 mg/L
Chromium	1 mg/L
Nickel	1 mg/L
Copper	5 mg/L
Zinc	5 mg/L
Lead	5 mg/L
Iron	17 mg/L
Chlorides measured as Cl	1500 mg/L
Sulphates measured as SO_4	1500 mg/L

Waste water in which the coliform count exceeds 1400 per 100 mL

5.4 Aquatic Environment

5.4.1 Legislation

Both the City of Toronto and Metropolitan Toronto have established by-laws respecting discharges into sanitary, storm and combined sewers. City of Toronto By-law No. 367-70 applies to all sewer types but contains few specific regulations on discharges into its system. Metro By-law No. 2520 regulates the quality of discharges to its system by specifying limits for a number of quality parameters for both sanitary and combined, and storm sewers. A summary of the pertinent regulations is presented in Table 5-10.

Discharges from the proposed steam plant will meet the Metro Toronto By-law limits.

The Ministry of the Environment has jurisdiction over the management of the quality and quantity of surface waters across the Province. However, discharges from the proposed steam plant will not likely be directly subject to MOE regulations since it is planned that all aqueous discharges be connected to the municipal sewer system.

5.4.2 Water Requirements, Waste Water Discharges and Controls

The major water requirements are boiler feedwater, cooling water for the furnace feed chutes and make-up water for the residue quench tanks, with the boiler feedwater requiring treatment to remove the dissolved mineral content prior to conversion to steam. Chute cooling water is discharged into the residue quench tank for subsequent recycling; residue quench make-up replaces water lost with the ash and the recycle system bleed-off.

Other than water used for the above processes, the only water demand on a continuous basis is for the domestic hot and cold water supply. Table 5-11 summarizes average and peak water requirements for both the RFSP and FFSP.

The estimated average and peak wastewater discharge rates from both the RFSP and FFSP are summarized in Table 5-12. The level of pollution in each individual waste stream from the RFSP can not be identified until actual operational monitoring has been carried out; however, a qualitative description is presented in the Technical Discussion, based on data from other incineration facilities and knowledge of the water uses.

Treatment and mixing for dilution of respective contaminants or moderation of high temperatures of various discharge streams will reduce pollutant levels in the final combined discharge stream to below sewer by-law limits. If required, City water will be used for mixing.

Table 5-11

Water Requirements For The Refuse Fired Steam Plant

	Combined Facility (RFSP)(3)		Fossil-Fuel Facility Alternative (FFSP)(4)	
	Avg (Igpm)	Peak (Igpm)	Avg (Igpm)	Peak (Igpm)
Boiler Feedwater	567	820	414	807
Furnace Feed Chute Cooling	115	115	N/A	N/A
Residue Quench Makeup	45	175	N/A	N/A
Domestic Hot and Cold	1	120	1	50
Fire Protection	-	1000	-	1000

Miscellaneous	15	303	13	50
Total	743	1677(2)	428	1357(2)

Notes:

1. Furnace feed chute cooling water is discharged into residue quench tank and is recycled, thus does not contribute to plant water demands.
2. Total peak demand based on boiler feedwater supply at 100 per cent capacity and 50 per cent of remaining demands.
3. The RFSP utilizes 2 refuse incinerators 635 t/d capacity and 2 gas/oil fired boilers 100 000 lbs/h steam generation capacity.
4. The FFSP utilizes 4 gas/oil fired boilers 150 000 lbs/h steam generation capacity.

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Table 5-12

Discharges To Sewers From The Refuse Fired Steam Plant

	Combined Facility (RFSP)(2)		Fossil-Fuel Facility Alternative (FFSP)(3)	
	Avg (Igpm)	Peak (Igpm)	Avg (Igpm)	Peak (Igpm)
Residue Quench System Wastewater Bleedoff	15	30	-	-
Blowdown	6	10	5	10
Other Losses from Heating Steam Systems	-	-	1	1
Domestic Hot and Cold	1	120	1	50
Miscellaneous	10	45	13	50
Water Treatment	201	250	20(1)	250
Total	52	455	40	361

Notes:

1. Approximate average flow over 2-hours based on a total wastewater discharge of 30 000 Igal Over one regeneration cycle, which occurs once per day.
2. The RFSP utilizes 2 refuse incinerators 635 t/d capacity and 2 gas/oil fired boilers 100 000 lbs/h steam generation capacity.
3. The FFSP utilizes 4 gas/oil fired boilers 150 000 lbs/h steam generation capacity.

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5.4.3 Aquatic Impact

Although there is the potential for increased levels of suspended solids, oil and grease in storm runoff during construction of the steam plant, it is reasonable to drain storm runoff to existing receiving bodies since the condition will be transitory.

During plant operation all process and other wastewater will be discharged to sanitary sewers. Any process stream which may be potentially in violation of Metro sewer by-law regulations can be treated as necessary.

It is assumed that refuse spillage and debris on site will be completely cleaned up without delay, thus contaminated surface runoff will not present a serious problem. Areas of potential oil spillages will be moated and/or sealed and oil-water separation will be provided.

5.4.4 Monitoring and Surveillance

To ensure that aqueous discharges from the steam plant will comply with sewer by-law regulations, the quality of the individual waste streams and the final combined effluent to the sewer system will be subject to regular monitoring both during the start-up period and during plant operation. A monitoring programme is proposed and described in the Technical Discussion for both periods, outlining sampling frequency, streams to be sampled, and parameters to be measured.

The proposed monitoring programme is based on anticipated quality levels of the discharges and the limits set in the sewer by-law. The programme will be modified, if necessary, in the light of operating experience.

5.5 Summary

The site is zoned for industrial use and is located within an industrial area. As such, the operation of the plant will not be detrimental to the natural environment nor to other land uses in the vicinity.

Precautions during construction, careful design for storage areas (oil, coal or refuse respectively), and appropriate operational procedures will reduce or eliminate the possibility of accidental spillage or leakage of contaminants such as stored oils, residue wastewaters or contaminated precipitation runoff.

Either the Refuse Fired Steam Plant or the Fossil Fuel Fired Steam Plant alternative can be built and operated within the existing legislative constraints for air emissions, air quality, noise and vibration, and odour. Ameliorating measures designed into the plant or able to be put into effect on short notice are expected to keep adverse impacts to a minimum during construction and process upsets.

Although it is anticipated that the plant should not have any difficulty in meeting Ontario tentative standards for point of impingement concentrations of trace toxics such as tetra-CDDs, continued public concern over their potential hazard dictates special design and operation emphasis to ensure a conservative approach to this issue.

There will be no significant impact on either sewer systems or surface water quality. Monitoring of the plant discharges will ensure that potential deviations from the norm are detected, the source of upset located and ameliorating measures instituted quickly. Moreover due to dilution within the Metro sewer system (which currently directs some 160 MIGD to treatment), the impact of discharges from the steam plant will be negligible.

6.0 Public Participation

A summary of the project and its consequences together with an invitation to attend a public presentation was submitted to more than 300 associations, interested groups, companies or individuals. The general public was invited to meetings held on September 15 and September 20, 1982, by advertisements placed twice in Toronto's three daily newspapers and in community papers. At these two meetings, and at the meeting of the South East Area Industrial Co-ordinating Committee on September 28, 1982, information outlining the project was presented and questions and comments solicited from interested parties.

Those who attended the meetings generally could be identified as belonging to one or other of the following four groups:

(a) Industries located in the Harbour area.

(b) Business companies involved in refuse disposal or manufacturing and/or marketing refuse incineration and air pollution control equipment.

(c) Agencies involved in refuse disposal, energy distribution or management and district heating.

(d) Citizens, mainly from the nearby St Lawrence and Longboat Neighbourhoods.

While questions and comments from the groups a) through c) were by and large related to their business and commercial interests, and in general supportive of the proposal, the citizens expressed concerns regarding the impact the operation of the proposed plant could have on the environment. Questions raised and their respective answers included:

Q1: Why here, i.e. on the former Gulf Oil site at Cherry Street and Lake Shore Blvd East? Is the proposal compatible with the existing zoning designation? Were other sites investigated?

A: In 1975, City's Planning Board established site criteria for the location of a refuse fired steam plant with respect to the proximity to the steam load centre and residential areas, accessibility from arterial roads, zoning designation, etc. Four sites were evaluated on the basis of these criteria and the Gulf Oil site appeared to be the most suitable. In 1979, when this Site which is zoned for heavy industry became available, the City purchased it.

Q2: Residents of the St Lawrence Neighbourhood are already occasionally exposed to odours from a rendering plant very close to the Gulf Oil Site. Does the operation of a refuse incinerator add to this?

A: No:

(a) Refuse tipping and handling will be carried out in an enclosed space.

(b) The refuse incineration process requires large volumes of oxygen. Air for combustion will be drawn from the storage pit and tipping area in the enclosed space, thus preventing the escape of odours from the building.

(c) Furnace design calls for combustion temperature higher than 980 degrees Celsius. At such temperatures all odours in the flue gases are destroyed.

Q3: How safe is the plant? What are the health hazards of the plant? Are any studies being done on dioxin emission? Have similar plants been tested abroad and in Europe for dioxin? Does HCl contribute to acid rain?

A: The refuse to be incinerated at the proposed plant will be of the residential and commercial type. Hazardous wastes will not be accepted. This has been the practice at municipal incinerators for many decades all over the world, especially in Europe. To the knowledge of the panel, to date, no case has been reported that a municipal incinerator has been or is a health hazard to people living or working in the vicinity of the plant.

Nevertheless, hydrochloric acid (HCl) and polychlorinated dibenzo-dioxins (PCDD's) can be generated in the combustion process with plastics being the source for HCl and PCDD formation. Each chemical can be a health hazard. However, as to the dioxin formation, refuse burning plant tests in Europe and the U.S.A. showed that dioxin and especially the highly toxic 2,3,7,8-TCDD is only a trace element in the flue gases. Moreover, analyses of the formation and destruction of organic chlorinated matter have indicated that formation of organic chlorinated compounds is impeded above 500 degrees Celsius and that these compounds are destroyed at elevated temperatures of the order of 1000 degrees Celsius. The design of the proposed plant will provide for such combustion temperatures.

With respect to HCl the Province of Ontario has developed concentration criteria. Compliance with these criteria is normally achieved by adequate dispersion controlled by proper flue gas velocity and stack height. However, it is possible that increasing plastic content in refuse may require more stringent standards and regulations. The design of the proposed RFSP contemplates the installation of scrubbing process at the initial or a later stage if so required.

As to the contribution to acid rain, HCl has never been implicated in acid rain. As for sulphur dioxide which is a source of acid rain, emission from the proposed RFSP will be considerably less than from the existing Pearl Street plant which is to be replaced by the RFSP.

Q4: Are the European standards more or less stringent than Canadian and American standards? Are Canadian standards and criteria sufficient? Will the new plant use higher standards than those laid down by the government?

A: With respect to emissions from the combustion of municipal refuse, European standards are very similar to North American standards. There is a tendency to make these standards uniform world-wide.

Based on thirty or more years of European experience in refuse incineration without health hazard it could be assumed that Canadian Standards, being similar to European, are sufficient. In order not to put an unduly heavy burden on society, emission rates are set to comply with existing standards although concentrations of many pollutants will be considerably better than requirements.

Q5: What is the public's involvement in the future? Are there any more meetings planned? Is there any way the public can legally object to the proposal? Will the project be subject to the Environmental Assessment Act? When will designs be submitted to the Ministry of Environment?

A: At this stage there are no more public meetings planned. However, the City's Department of Public Works is prepared to deal with questions and concerns from the public on an individual basis at any time.

The project will be subject to the Environmental Assessment Act, 1975, and the public can legally object to the proposal in this process of Environmental Approval in accordance with the Act. Submission of the Environmental Assessment documents to the Minister of the Environment, Ontario, for his review and decision, is planned for 1982 year end.

Q6: There is already considerable disturbance and high noise levels due to heavy traffic in the neighbourhood. Would not refuse delivery to the proposed plant add to this nuisance? Will there be any control over the truck routing?

A: The operation of the RFSP will generate approximately 250 truck round trips per day. The trucks will approach the Site on Lake Shore Blvd from the west and the east and on the Don Valley Parkway from the north. Considering the existing daily traffic volume - 91,550 vehicles (16,479 trucks) on the Gardiner Expressway and 24,628 vehicles (6,157 trucks) on the Lake Shore Blvd East - the impact of the additional truck traffic generated by the RFSP will be negligible.

As to the St Lawrence Neighbourhood, specifically, there will be no addition to the number of trucks passing through that area since the refuse collection trucks serving that neighbourhood and the area north of it are already going south using the Commissioners Street incinerator as a disposal site. No change to this existing collection procedure will result from the operation of the proposed RFSP.

Q7: Will waste water be discharged into the Lake?

A: Not directly; any waste water generated at the RFSP will be discharged into a sanitary sewer and will satisfy Metro Toronto By-law regulations. In order to comply with these limits some pre-treatment might be required at the plant site. Final treatment of waste water will then take place at Metro's main sewage treatment plant at Ashbridges Bay.

Q8: What types of financing were investigated to determine the economic feasibility? Will the public debt be a City of Toronto or a Metro debt? Will the operation of the RFSP have any impact on the property tax rate?

A: Financing schemes investigated were:

(a) 100% financed by public debt; Metro would issue debentures on behalf of the City of Toronto

(b) 60% debt to 40% equity ratio for private enterprise.

Both schemes showed a satisfactory return on investment and return on equity.

The operation of the plant will not have a negative impact on the property tax rate since the plant is self-sustaining. So far, there is no decision or agreement on how to distribute and use the long-term operational profit. However, logically the steam customers, the refuse collection system and the plant operator should benefit from it.